FCC Test Report

Client Name	:	DDPAI Technology Co., Ltd
Address	:	Floor 12,Yihua finance building, Nanshan software industry park, Xuefu Rd, Nanshan district, Shenzhen, China
Product Name	:	Dash Cam
Date	:	Dec. 02, 2021

Shenzhen Anbotek Compliance Laboratory Limited

Contents

TEST REPORT

Applicant	:	DDPAI Technology Co., Ltd
Manufacturer	:	DDPAI Technology Co., Ltd
Product Name	:	Dash Cam
Model No.	:	X5 Pro
Trade Mark	:	DDPAI
Rating(s)	:	Input: DC 12V, 1A

Test Standard(s)	:	**FCC Part15 Subpart E, Paragraph 15.407** **ANSI C63.10: 2020,**
Test Method(s)	:	**KDB 789033 D02 General UNII Test Procedures New Rules v02r01** **KDB662911 D01 Multiple Transmitter Output v02r01**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart E requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt	Nov. 15, 2021
Date of Test	Nov. 15~25, 2021

Prepared By

(Ella Liang)

Approved & Authorized Signer

(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	DDPAI Technology Co., Ltd
Address	:	Floor 12,Yihua finance building, Nanshan software industry park, Xuefu Rd, Nanshan district, Shenzhen, China
Manufacturer	:	DDPAI Technology Co., Ltd
Address	:	Floor 12,Yihua finance building, Nanshan software industry park, Xuefu Rd, Nanshan district, Shenzhen, China
Factory	:	DDPai vision equipment Co.,Ltd
Address	:	Building A, Futai Industrial Park, Qingfeng south Road, Keyuancheng, Tangxia Town, Dongguan city, Guangdong province, China

1.2. Description of Device (EUT)

Product Name	:	Dash Cam	
Model No.	:	X5 Pro	
Trade Mark	:	DDPAI	
Test Power Supply	:	DC 12V	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	WiFi 5.2G: 5180~5240MHz WiFi 5.8G: 5745~5825MHz
		Number of Channel:	WiFi 5.2G: 4 Channels for 802.11a/n(HT20)/ac(HT20) 2 Channels for 802.11n(HT40)/ac(HT40) WiFi 5.8G: 5 Channels for 802.11a/n(HT20)/ac(HT20) 2 Channels for 802.11n(HT40)/ac(HT40)
		Modulation Type:	WiFi 5.2G&WiFi 5.8G: OFDM with BPSK/QPSK/16QAM/64QAM/256QAM
		Antenna Type:	WiFi 5.2G & WiFi 5.8G: FPC Antenna
		Antenna Gain(Peak):	WiFi 5.2G/ WiFi 5.8G: 2dBi (Provided by customer)
		Adapter:	N.A.
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for 5.2G WiFi&WiFi 5.8G module.			

1.3. Auxiliary Equipment Used During Test

N.A.	:	

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Frequency Band	Mode	Test channel	Frequency (MHz)
5.2GHz	OFDM(802.11a/n20/ac20)	CH 36	5180MHz
		CH 40	5200MHz
		CH 48	5240MHz
	OFDM(802.11n40/ac40)	CH 38	5190MHz
		CH 46	5230MHz
5.8GHz	OFDM(802.11a/n20/ac20)	CH 149	5745MHz
		CH 157	5785MHz
		CH 165	5825MHz
	OFDM(802.11n40/ac40)	CH 151	5755MHz
		CH 159	5795MHz

Note:

1. The measurements are performed at the highest, middle, lowest available channels.
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω, Cable Loss: 1.0 dB
4. The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is more than 98%

1.5. List of channels

5.2G:

802.11a/n20/ac20

Channel	Freq. (MHz)	Channel	Freq. (MHz)
36	5180	44	5220
40	5200	48	5240

802.11n40/ac40

Channel	Freq. (MHz)	Channel	Freq. (MHz)
38	5190	46	5230

5.8G:

802.11a/n20/ac20

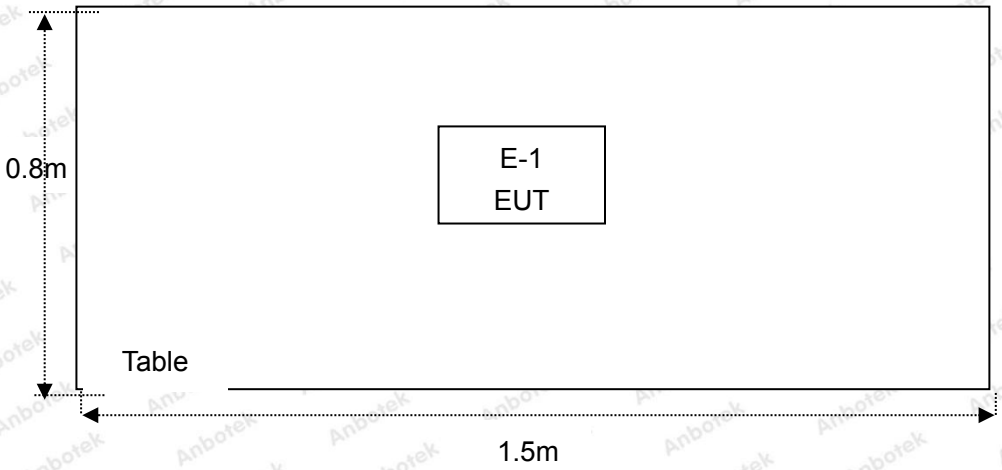
Channel	Freq.(MHz)	Channel	Freq.(MHz)
149	5745	153	5765
157	5785	161	5805
165	5825		

802.11n40/ac40

Channel	Freq.(MHz)	Channel	Freq.(MHz)
151	5755	159	5795

1.6. Description Of Test Setup

RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul 05, 2021	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 22, 2021	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 22, 2021	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 22, 2021	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 22, 2021	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 22, 2021	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Oct. 22, 2021	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 22, 2021	1 Year
16.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 22, 2021	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2021	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 22, 2021	1 Year

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500 www.anbotek.com

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, 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 our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	N/A
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(ii)	Maximum Conducted Output Power	PASS
15.407(a)(1)	Peak Power Spectral Density	PASS
15.203	Antenna Requirement	PASS
15.407(g)	Frequency Stability	PASS
15.407(i)	DFS(Dynamic Frequency Selection)	N/A

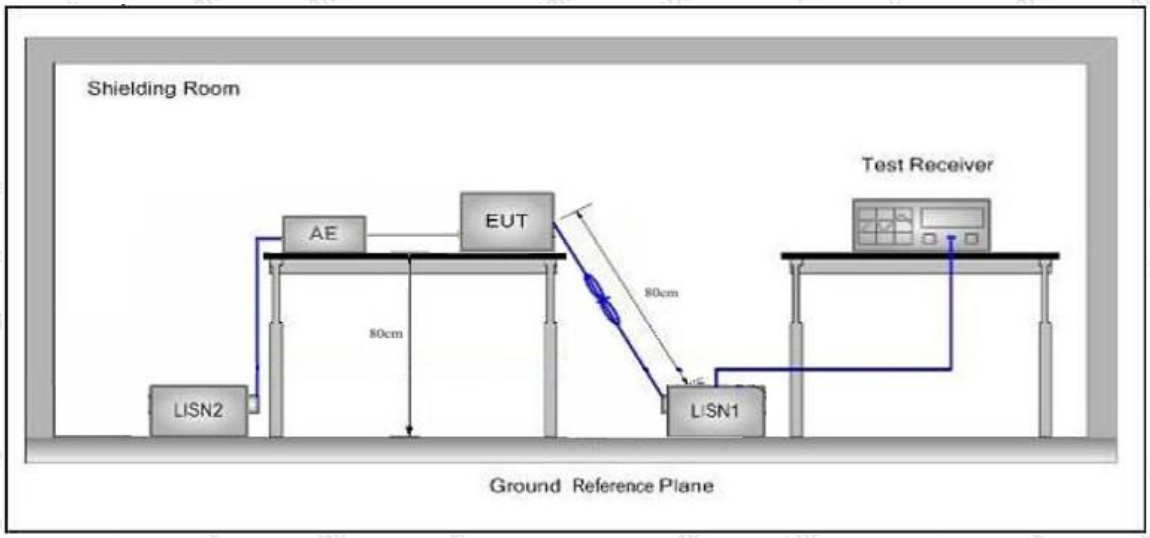
Remark: “N/A” is an abbreviation for Not Applicable.

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207&15.407		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

This device is a Driving recorder, which is intended to be installed on a vehicle only, not connect to the public utility under normal use.15.207 test is exempted.

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Radiated Spurious Emission					
Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.407				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	68.2	Peak	3

Band Edge				
Test Standard	15.407(b)			
Test Limit	Operating Band	Frequency	EIRP Limit	Remark
	5150-5250MHz	Above 1GHz	-27dBm/MHz(68.2dBuV/m)@3m	Peak
	5250-5350MHz	Above 1GHz	-27dBm/MHz(68.2dBuV/m)@3m	Peak
	5470-5725MHz	Above 1GHz	-27dBm/MHz(68.2dBuV/m)@3m	Peak
	5725-5850 MHz	Above 1GHz	-27dBm/MHz(68.2dBuV/m)@3m	Peak
		1GHz-5.65GHz	-27*dBm/MHz to 10dBm/MHz (68.2* dBuV/m to 105.6dBuV/m)	Peak
		5.65GHz-5.7GHz	10*dBm/MHz to 15.6dBm/MHz (105.6*dBuV/m to 110.8dBuV/m)	Peak
		5.7GHz-5.72GHz	15.6*dBm/MHz to 27dBm/MHz (110.8dBuV/m to* 122.2dBuV/m)	Peak
		5.72GHz-5.725GHz	27dBm/MHz to 15.6*dBm/MHz (122.2dBuV/m to110.8* dBuV/m)	Peak
		5.85GHz-5.855GHz	15.6dBm/MHz to 10*dBm/MHz (110.8dBuV/m to 105.6* dBuV/m	Peak

		5.855GHz-5.875GHz	10dBm/MHz to -27*dBm/MHz (105.6dBuV/m to 68.2* dBuV/m)	Peak
		5.875GHz-5.925GHz	-27 dBm/MHz(68.2dBuV/m)@3m	Peak

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

(3)Above 1GHz limit:E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBuV/m, for EIPR[dBm]=-27dBm.

4.2. Test Setup

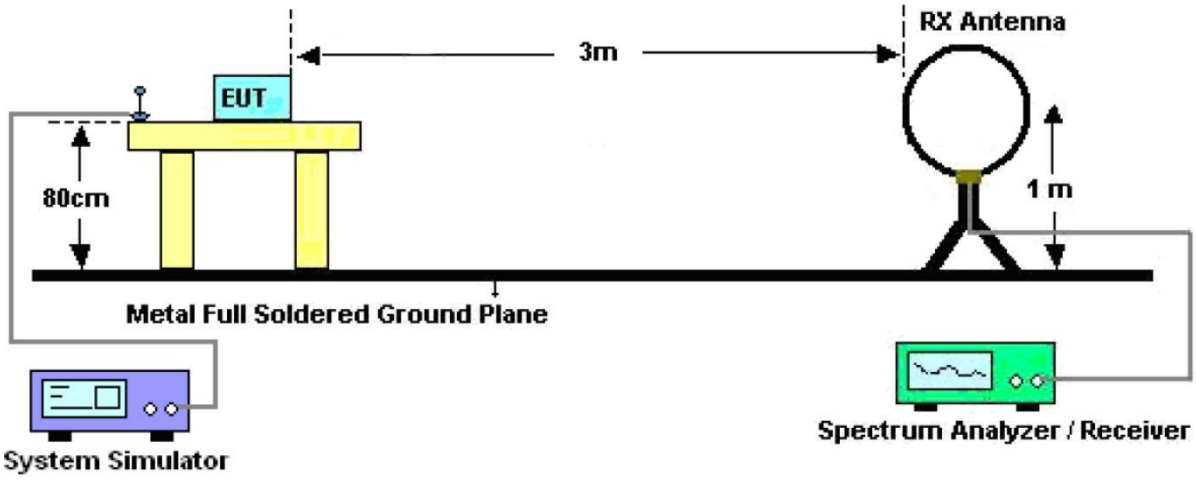


Figure 1. Below 30MHz

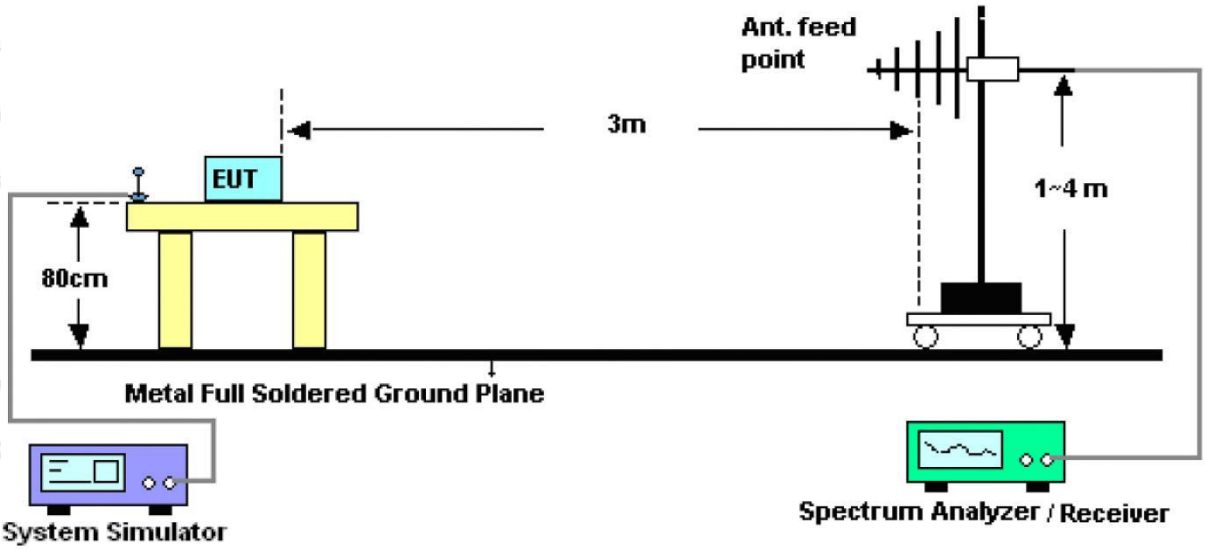


Figure 2. 30MHz to 1GHz

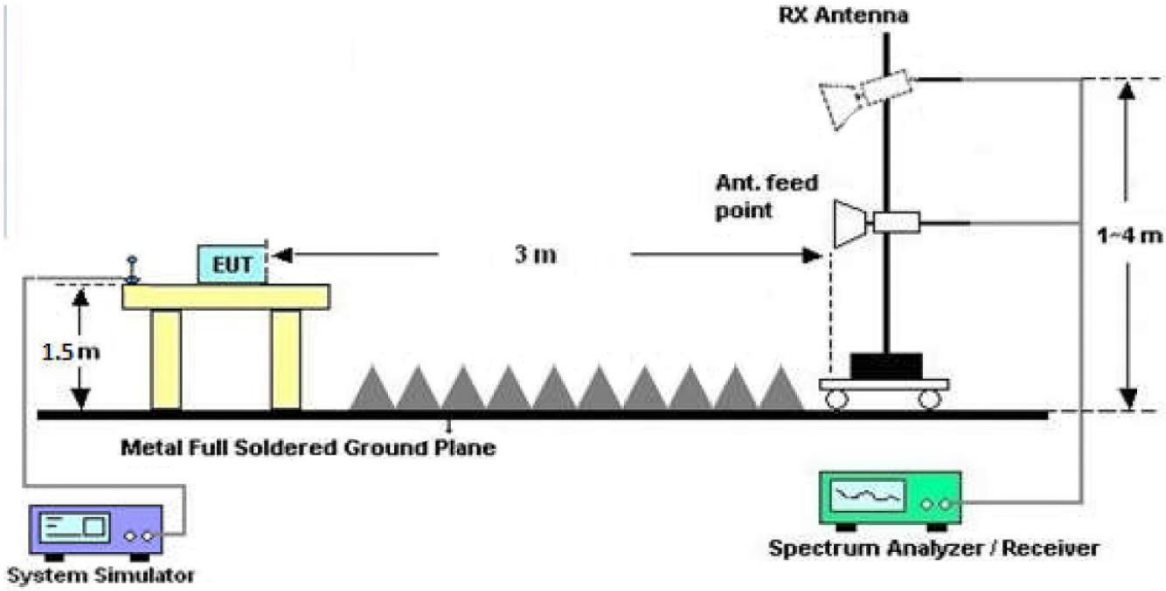


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.
For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

.

For above 1GHz, Set the spectrum analyzer as:

RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

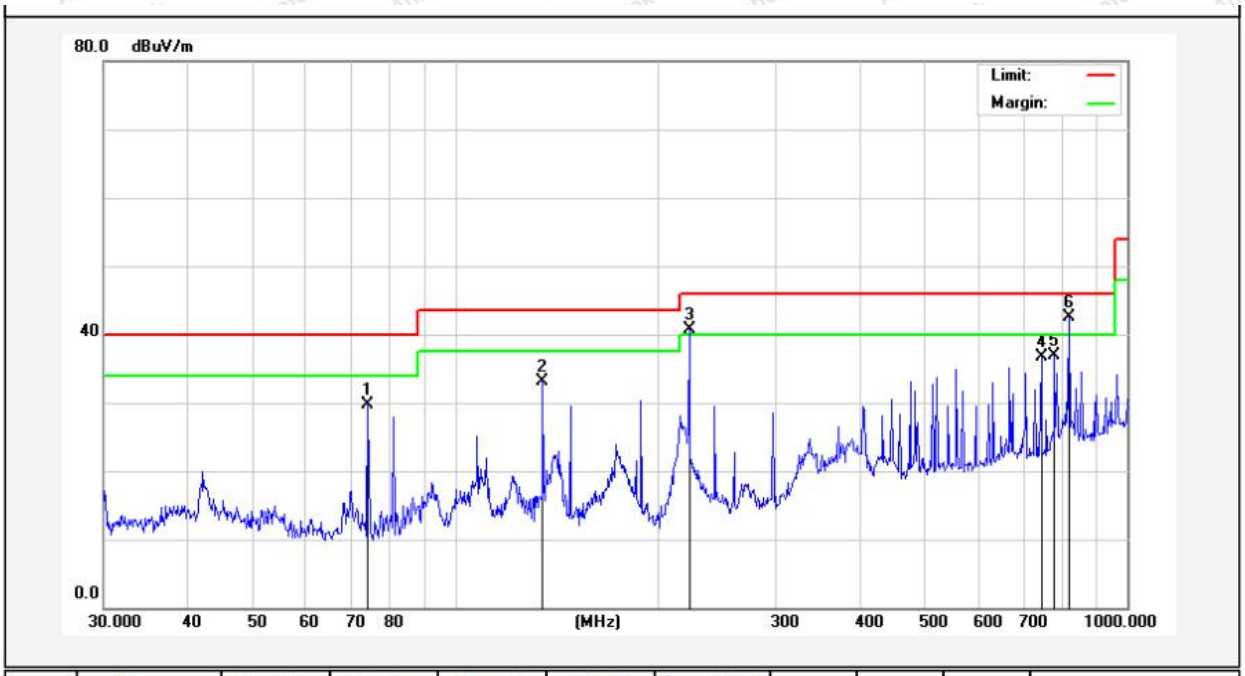
PASS

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Note: During the test, pre-scan all modes, and found the 802.11ac (HT40) CH38 which is the worst case, only the worst case is recorded in the report.

Test Results (30~1000MHz)

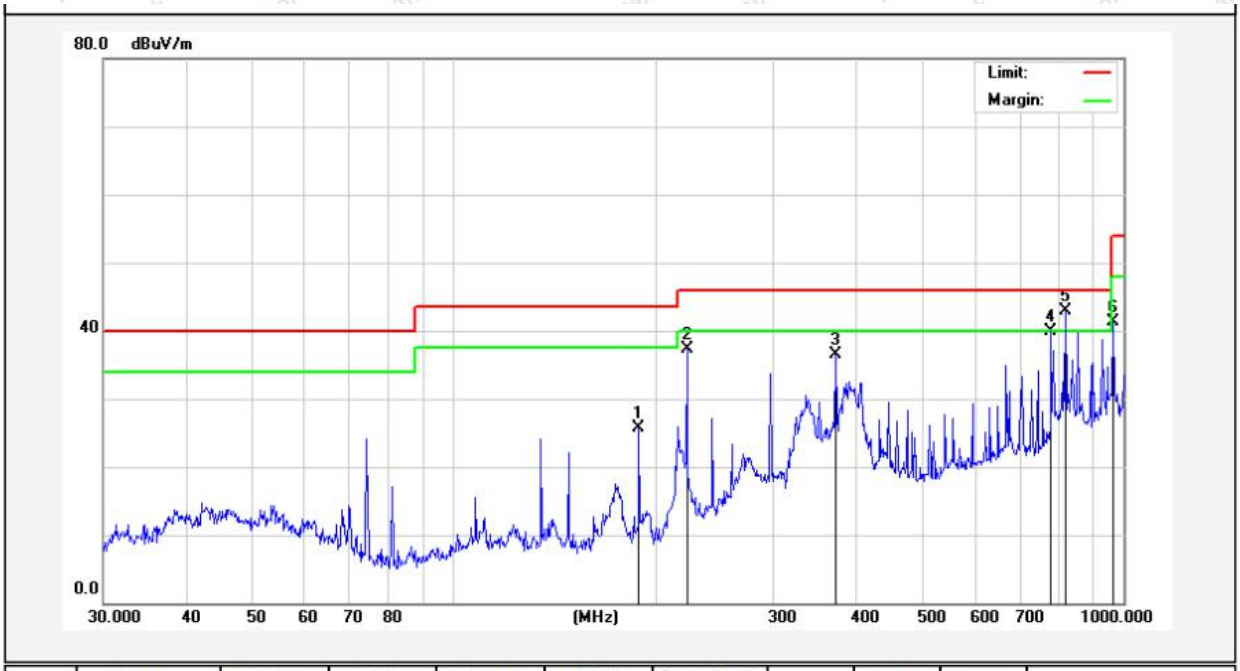
Test Mode:	802.11ac (HT40) CH38
Power Source:	DC 12V
Polarization:	Vertical
Temp.(℃)/Hum.(%RH):	23.6℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	74.1351	49.69	-19.89	29.80	40.00	-10.20	QP			
2	135.0319	54.96	-21.83	33.13	43.50	-10.37	QP			
3	222.9502	59.67	-18.88	40.79	46.00	-5.21	QP			
4	744.8661	46.01	-9.30	36.71	46.00	-9.29	QP			
5	779.6068	45.53	-8.66	36.87	46.00	-9.13	QP			
6	818.8341	50.57	-7.97	42.60	46.00	-3.40	QP			

Test Results (30~1000MHz)

Test Mode:	802.11ac (HT40) CH38
Power Source:	DC 12V
Polarization:	Horizontal
Temp.(℃)/Hum.(%RH):	23.6℃/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	189.0743	48.41	-22.80	25.61	43.50	-17.89	QP			
2	222.9502	59.26	-21.95	37.31	46.00	-8.69	QP			
3	372.0045	52.61	-16.06	36.55	46.00	-9.45	QP			
4	779.6068	48.61	-8.66	39.95	46.00	-6.05	QP			
5	818.8341	50.81	-7.97	42.84	46.00	-3.16	QP			
6	965.5421	46.60	-5.36	41.24	54.00	-12.76	QP			

Test Results (Above 1000MHz)

Test Mode: IEEE 802.11ac (HT40)				Test channel: Low CH		
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	29.24	23.81	53.05	68.20	-15.15	V
15570.00	30.27	28.91	59.18	68.20	-9.02	V
10380.00	29.96	23.81	53.77	68.20	-14.43	H
15570.00	31.05	28.91	59.96	68.20	-8.24	H
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	polarization
10380.00	19.83	23.81	43.64	54.00	-10.36	V
15570.00	20.18	28.91	49.09	54.00	-4.91	V
10380.00	19.91	23.81	43.72	54.00	-10.28	H
15570.00	20.06	28.91	48.97	54.00	-5.03	H

Test Mode: IEEE 802.11ac (HT40)				Test channel: High CH		
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	29.31	23.80	53.11	68.20	-15.09	V
15690.00	30.56	30.03	60.59	68.20	-7.61	V
10460.00	30.24	23.80	54.04	68.20	-14.16	H
15690.00	31.33	30.03	61.36	68.20	-6.84	H
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over limit(dB)	polarization
10460.00	19.80	23.80	43.60	54.00	-10.40	V
15690.00	20.17	30.03	50.20	54.00	-3.80	V
10460.00	20.21	23.80	44.01	54.00	-9.99	H
15690.00	20.23	30.03	50.26	54.00	-3.74	H

Remark:

1. During the test, pre-scan the 802.11a, 802.11n(HT20), ac(HT20), n(HT40), ac(HT40) mode, and found the 802.11ac (HT40) mode is worse case , the report only record this mode.
2. Result =Reading + Factor

Radiated Band Edge:

5.2G:

Test Mode: 802.11a	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5150.00	36.73	15.99	52.72	68.20	-15.48	Horizontal
5150.00	38.75	15.99	54.74	68.20	-13.46	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5150.00	26.73	15.99	42.72	54.00	-11.28	Horizontal
5150.00	28.72	15.99	44.71	54.00	-9.29	Vertical

Test Mode: 802.11a	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5250.00	37.24	16.43	53.67	68.20	-14.53	Horizontal
5250.00	40.03	16.43	56.46	68.20	-11.74	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5250.00	28.47	16.43	44.90	54.00	-9.10	Horizontal
5250.00	29.46	16.43	45.89	54.00	-8.11	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11n20	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5150.00	35.76	15.99	51.75	68.20	-16.45	Horizontal
5150.00	37.09	15.99	53.08	68.20	-15.12	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5150.00	26.48	15.99	42.47	54.00	-11.53	Horizontal
5150.00	27.50	15.99	43.49	54.00	-10.51	Vertical

Test Mode: 802.11n20	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5250.00	37.54	16.43	53.97	68.20	-14.23	Horizontal
5250.00	38.62	16.43	55.05	68.20	-13.15	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5250.00	27.55	16.43	43.98	54.00	-10.02	Horizontal
5250.00	28.93	16.43	45.36	54.00	-8.64	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11n40	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5150.00	36.19	15.99	52.18	68.20	-16.02	Horizontal
5150.00	38.07	15.99	54.06	68.20	-14.14	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5150.00	26.74	15.99	42.73	54.00	-11.27	Horizontal
5150.00	28.63	15.99	44.62	54.00	-9.38	Vertical

Test Mode: 802.11n40	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5250.00	37.89	16.43	54.32	68.20	-13.88	Horizontal
5250.00	36.83	16.43	53.26	68.20	-14.94	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5250.00	27.99	16.43	44.42	54.00	-9.58	Horizontal
5250.00	29.15	16.43	45.58	54.00	-8.42	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11ac(HT20)	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5150.00	36.63	15.99	52.62	68.20	-15.58	Horizontal
5150.00	38.34	15.99	54.33	68.20	-13.87	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5150.00	26.39	15.99	42.38	54.00	-11.62	Horizontal
5150.00	28.50	15.99	44.49	54.00	-9.51	Vertical

Test Mode: 802.11ac(HT20)	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5250.00	37.71	16.43	54.14	68.20	-14.06	Horizontal
5250.00	37.99	16.43	54.42	68.20	-13.78	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5250.00	27.58	16.43	44.01	54.00	-9.99	Horizontal
5250.00	28.05	16.43	44.48	54.00	-9.52	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11ac(HT40)	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5150.00	35.60	15.99	51.59	68.20	-16.61	Horizontal
5150.00	36.14	15.99	52.13	68.20	-16.07	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5150.00	25.67	15.99	41.66	54.00	-12.34	Horizontal
5150.00	26.52	15.99	42.51	54.00	-11.49	Vertical

Test Mode: 802.11ac(HT40)	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5250.00	37.80	16.43	54.23	68.20	-13.97	Horizontal
5250.00	37.01	16.43	53.44	68.20	-14.76	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5250.00	27.32	16.43	43.75	54.00	-10.25	Horizontal
5250.00	27.09	16.43	43.52	54.00	-10.48	Vertical

Remark: 1. Result =Reading + Factor

Radiated Band Edge:

5.8G:

Test Mode: 802.11a	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5725.00	38.80	17.05	55.85	68.20	-12.35	Horizontal
5725.00	39.44	17.05	56.49	68.20	-11.71	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	28.82	17.05	45.87	54.00	-8.13	Horizontal
5725.00	29.90	17.05	46.95	54.00	-7.05	Vertical

Test Mode: 802.11a	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5850.00	38.77	17.21	55.98	68.20	-12.22	Horizontal
5850.00	39.08	17.21	56.29	68.20	-11.91	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	28.80	17.21	46.01	54.00	-7.99	Horizontal
5850.00	28.87	17.21	46.08	54.00	-7.92	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11n20	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5725.00	37.93	17.05	54.98	68.20	-13.22	Horizontal
5725.00	38.27	17.05	55.32	68.20	-12.88	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	27.43	17.05	44.48	54.00	-9.52	Horizontal
5725.00	27.88	17.05	44.93	54.00	-9.07	Vertical

Test Mode: 802.11n20	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	37.01	17.21	54.22	68.20	-13.98	Horizontal
5850.00	37.70	17.21	54.91	68.20	-13.29	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	27.19	17.21	44.40	54.00	-9.60	Horizontal
5850.00	28.13	17.21	45.34	54.00	-8.66	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11n40	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5725.00	38.23	17.05	55.28	68.20	-12.92	Horizontal
5725.00	38.81	17.05	55.86	68.20	-12.34	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	26.80	17.05	43.85	54.00	-10.15	Horizontal
5725.00	28.23	17.05	45.28	54.00	-8.72	Vertical

Test Mode: 802.11n40	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
5850.00	37.76	17.21	54.97	68.20	-13.23	Horizontal
5850.00	38.22	17.21	55.43	68.20	-12.77	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	27.91	17.21	45.12	54.00	-8.88	Horizontal
5850.00	29.08	17.21	46.29	54.00	-7.71	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11ac(HT20)	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	37.68	17.05	54.73	68.20	-13.47	Horizontal
5725.00	38.19	17.05	55.24	68.20	-12.96	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	28.10	17.05	45.15	54.00	-8.85	Horizontal
5725.00	28.77	17.05	45.82	54.00	-8.18	Vertical

Test Mode: 802.11ac(HT20)	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	37.84	17.21	55.05	68.20	-13.15	Horizontal
5850.00	38.78	17.21	55.99	68.20	-12.21	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	27.77	17.21	44.98	54.00	-9.02	Horizontal
5850.00	28.73	17.21	45.94	54.00	-8.06	Vertical

Remark: 1. Result =Reading + Factor

Test Mode: 802.11ac(HT40)	Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	36.50	17.05	53.55	68.20	-14.65	Horizontal
5725.00	38.01	17.05	55.06	68.20	-13.14	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5725.00	27.38	17.05	44.43	54.00	-9.57	Horizontal
5725.00	28.09	17.05	45.14	54.00	-8.86	Vertical

Test Mode: 802.11ac(HT40)	Test channel: Highest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	37.45	17.21	54.66	68.20	-13.54	Horizontal
5850.00	38.17	17.21	55.38	68.20	-12.82	Vertical

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Polarization
5850.00	27.42	17.21	44.63	54.00	-9.37	Horizontal
5850.00	26.96	17.21	44.17	54.00	-9.83	Vertical

Remark: 1. Result =Reading + Factor

Conducted Measurement:

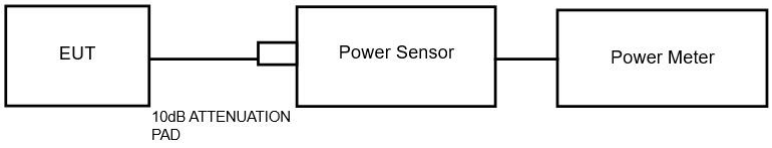
Please refer to Appendix D of the Appendix Test Data.

5. Maximum conducted output power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407(a)	
Test Limit	5.15 - 5.25GHz	1) Outdoor AP The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if GTx>6dBi, then Pout =30-(GTx-6). e.i.r.p. at any elevation angle above 30 degrees≤125mW (21dBm) 2) Indoor AP The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if GTx>6dBi, then Pout =30-(GTx-6). 3) Point-to-point AP The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if GTx>23dBi, then Pout =30-(GTx-23). 4) Client devices The maximum conducted output power (Pout) shall not exceed the lesser of 250W (24dBm). if GTx>6dBi, then Pout =24-(GTx-6).
	5.25 - 5.35GHz	The maximum conducted output power (Pout) shall not exceed the lesser of 250mW (24dBm) or 11dBm+10 log B, where B is the 26dB emission bandwith in MHz. if GTx>6dBi, then Pout =24-(GTx-6).
	5.47- 5.725GHz	The maximum conducted output power (Pout) shall not exceed the lesser of 250mW (24dBm) or 11dBm+10 log B, where B is the 26dB emission bandwith in MHz. if GTx>6dBi, then Pout =24-(GTx-6).
	5.725 - 5.85GHz	1) Point-to-multipoint systems (P2M) The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm). if GTx>6dBi, then Pout =30-(GTx-6). 2) Point-to-point systems (P2P) The maximum conducted output power (Pout) shall not exceed the lesser of 1W (30dBm).

5.2. Test Setup



5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

5.4. Test Data

Pass

Please refer to Appendix B of the Appendix Test Data.

Additional test for duty cycle.

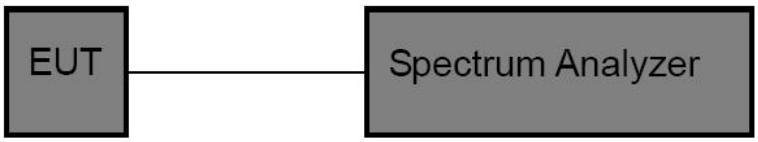
Please refer to Appendix H of the Appendix Test Data.

6. Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.407 (a)(5)

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

26 dB &99%bandwidth

RBW = approximately 1% of the emission bandwidth;
Set the VBW＞RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

6 dB bandwidth

RBW = approximately 1% of the emission bandwidth;
Set the VBW＞RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

4. Measure the maximum width of the emission that is 26dB /6dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer.

5. Repeat until all the rest channels are investigated.

6.4. Test Data

Pass

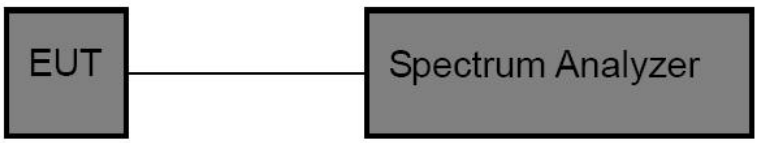
Please refer to Appendix A1&A2&A3 of the Appendix Test Data.

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407(a)	
Test Limit	5.15 - 5.25GHz	1) Outdoor AP The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if GTx>6dBi, then PSD =17-(GTx-6). 2) Indoor AP The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if GTx>6dBi, then PSD =17-(GTx-6). 3) Point-to-point AP The peak power spectral density (PSD) shall not exceed the lesser of 17dBm/MHz. if GTx>23dBi, then PSD =17-(GTx-23). 4) Client devices The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if GTx>6dBi, then PSD =11-(GTx-6).
	5.25 - 5.35GHz	The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if GTx>6dBi, then PSD =11-(GTx-6).
	5.47- 5.725GHz	The peak power spectral density (PSD) shall not exceed the lesser of 11dBm/MHz. if GTx>6dBi, then PSD =11-(GTx-6).
	5.725 - 5.85GHz	1) Point-to-multipoint systems (P2M) The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz. if GTx>6dBi, then PSD =30-(GTx-6). 2) Point-to-point systems (P2P) The peak power spectral density (PSD) shall not exceed the lesser of 30dBm/500kHz.

7.2. Test Setup



7.3. Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided

that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

1. The EUT is directly connected to the spectrum analyzer;
2. Set RBW =1MHz(for WIFI 5.2G&5.3G&5.6G) or Set RBW =300kHz(for WIFI 5.8G);
3. Set VBW ≥ 3 RBW=3MHz(for WIFI 5.2G&5.3G&5.6G) or Set VBW ≥ 3 RBW=1MHz (for WIFI 5.8G);
3. Set the span to encompass the entire emissions bandwidth (EBW) of the signal;
5. Detector=RMS;
6. Sweep time= auto couple;
7. Trace mode=max. hold;

7.4. Test Data

Pass

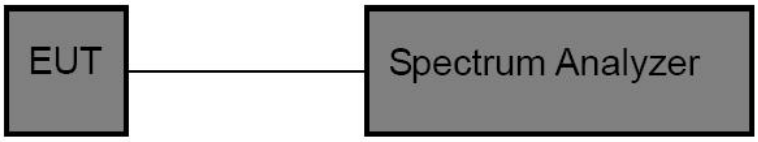
Please refer to Appendix C of the Appendix Test Data.

8. Frequency Stability

8.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
Test Limit	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

8.2. Test Setup



8.3. Test Procedure

The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

8.4. Test Data

Pass

Please to see the following pages.

Test Mode: 5.2G							
Mode	TX Type	Frequency (MHz)	Temperature (°C)	Voltage (VDC)	Measured Frequency (MHz)	Limit	Verdict
802.11a	SISO	5180	20	10.20	5180.04	5172 to 5188	Pass
				12.00	5180.02	5172 to 5188	Pass
				13.80	5180.06	5172 to 5188	Pass
			-30	12.00	5180.11	5172 to 5188	Pass
			-20	12.00	5180.07	5150 to 5250	Pass
			-10	12.00	5180.02	5150 to 5250	Pass
			0	12.00	5180.11	5150 to 5250	Pass
			10	12.00	5180.08	5150 to 5250	Pass
			30	12.00	5180.01	5150 to 5250	Pass
			40	12.00	5180.10	5150 to 5250	Pass
			50	12.00	5180.05	5172 to 5188	Pass
		5200	20	10.20	5200.10	5192 to 5208	Pass
				12.00	5200.06	5192 to 5208	Pass
				13.80	5200.09	5192 to 5208	Pass
			-30	12.00	5200.11	5192 to 5208	Pass
			-20	12.00	5200.01	5150 to 5250	Pass
			-10	12.00	5200.10	5150 to 5250	Pass
			0	12.00	5200.04	5150 to 5250	Pass
			10	12.00	5200.09	5150 to 5250	Pass
			30	12.00	5200.02	5150 to 5250	Pass
			40	12.00	5200.04	5150 to 5250	Pass
			50	12.00	5200.04	5192 to 5208	Pass
		5240	20	10.20	5240.05	5232 to 5248	Pass
				12.00	5240.06	5232 to 5248	Pass
				13.80	5240.09	5232 to 5248	Pass
			-30	12.00	5240.12	5232 to 5248	Pass
			-20	12.00	5240.03	5150 to 5250	Pass
			-10	12.00	5240.08	5150 to 5250	Pass
			0	12.00	5240.02	5150 to 5250	Pass
			10	12.00	5240.01	5150 to 5250	Pass
			30	12.00	5240.01	5150 to 5250	Pass
			40	12.00	5240.13	5150 to 5250	Pass
			50	12.00	5240.11	5232 to 5248	Pass
802.11n (HT20)	MIMO	5180	20	10.20	5180.05	5172 to 5188	Pass
				12.00	5180.04	5172 to 5188	Pass
				13.80	5180.03	5172 to 5188	Pass
			-30	12.00	5180.00	5172 to 5188	Pass
			-20	12.00	5180.11	5150 to 5250	Pass

			-10	12.00	5180.07	5150 to 5250	Pass
			0	12.00	5180.03	5150 to 5250	Pass
			10	12.00	5180.05	5150 to 5250	Pass
			30	12.00	5180.06	5150 to 5250	Pass
			40	12.00	5180.04	5150 to 5250	Pass
			50	12.00	5180.07	5172 to 5188	Pass
		5200	20	10.20	5200.09	5192 to 5208	Pass
				12.00	5200.10	5192 to 5208	Pass
				13.80	5200.05	5192 to 5208	Pass
			-30	12.00	5200.07	5192 to 5208	Pass
			-20	12.00	5200.09	5150 to 5250	Pass
			-10	12.00	5200.03	5150 to 5250	Pass
			0	12.00	5200.01	5150 to 5250	Pass
			10	12.00	5200.07	5150 to 5250	Pass
			30	12.00	5200.12	5150 to 5250	Pass
			40	12.00	5200.01	5150 to 5250	Pass
			50	12.00	5200.10	5192 to 5208	Pass
		5240	20	10.20	5240.00	5232 to 5248	Pass
				12.00	5240.11	5232 to 5248	Pass
				13.80	5240.09	5232 to 5248	Pass
			-30	12.00	5240.12	5232 to 5248	Pass
			-20	12.00	5240.03	5150 to 5250	Pass
			-10	12.00	5240.00	5150 to 5250	Pass
			0	12.00	5240.02	5150 to 5250	Pass
			10	12.00	5240.05	5150 to 5250	Pass
			30	12.00	5240.08	5150 to 5250	Pass
			40	12.00	5240.08	5150 to 5250	Pass
			50	12.00	5240.06	5232 to 5248	Pass
802.11n (HT40)	MIMO	5190	20	10.20	5190.07	5174 to 5206	Pass
				12.00	5190.07	5174 to 5206	Pass
				13.80	5190.05	5174 to 5206	Pass
			-30	12.00	5190.09	5174 to 5206	Pass
			-20	12.00	5190.13	5150 to 5250	Pass
			-10	12.00	5190.03	5150 to 5250	Pass
			0	12.00	5190.03	5150 to 5250	Pass
			10	12.00	5190.10	5150 to 5250	Pass
			30	12.00	5190.03	5150 to 5250	Pass
			40	12.00	5190.03	5150 to 5250	Pass
			50	12.00	5190.08	5174 to 5206	Pass
		5230	20	10.20	5230.12	5214 to 5246	Pass
				12.00	5230.02	5214 to 5246	Pass

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				13.80	5230.09	5214 to 5246	Pass
			-30	12.00	5230.10	5214 to 5246	Pass
			-20	12.00	5230.12	5150 to 5250	Pass
			-10	12.00	5230.03	5150 to 5250	Pass
			0	12.00	5230.13	5150 to 5250	Pass
			10	12.00	5230.06	5150 to 5250	Pass
			30	12.00	5230.03	5150 to 5250	Pass
			40	12.00	5230.02	5150 to 5250	Pass
			50	12.00	5230.08	5214 to 5246	Pass
802.11ac (VHT20)	MIMO	5180	20	10.20	5180.11	5172 to 5188	Pass
				12.00	5180.02	5172 to 5188	Pass
				13.80	5180.04	5172 to 5188	Pass
			-30	12.00	5180.12	5172 to 5188	Pass
			-20	12.00	5180.03	5150 to 5250	Pass
			-10	12.00	5180.05	5150 to 5250	Pass
			0	12.00	5180.09	5150 to 5250	Pass
			10	12.00	5180.05	5150 to 5250	Pass
			30	12.00	5180.03	5150 to 5250	Pass
			40	12.00	5180.02	5150 to 5250	Pass
			50	12.00	5180.05	5172 to 5188	Pass
		5200	20	10.20	5200.02	5192 to 5208	Pass
				12.00	5200.04	5192 to 5208	Pass
				13.80	5200.03	5192 to 5208	Pass
			-30	12.00	5200.01	5192 to 5208	Pass
			-20	12.00	5200.03	5150 to 5250	Pass
			-10	12.00	5200.01	5150 to 5250	Pass
			0	12.00	5200.02	5150 to 5250	Pass
			10	12.00	5200.11	5150 to 5250	Pass
			30	12.00	5200.10	5150 to 5250	Pass
			40	12.00	5200.03	5150 to 5250	Pass
			50	12.00	5200.09	5192 to 5208	Pass
		5240	20	10.20	5240.09	5232 to 5248	Pass
				12.00	5240.05	5232 to 5248	Pass
				13.80	5240.02	5232 to 5248	Pass
			-30	12.00	5240.11	5232 to 5248	Pass
			-20	12.00	5240.05	5150 to 5250	Pass
			-10	12.00	5240.02	5150 to 5250	Pass
			0	12.00	5240.01	5150 to 5250	Pass
			10	12.00	5240.07	5150 to 5250	Pass
			30	12.00	5240.09	5150 to 5250	Pass
			40	12.00	5240.02	5150 to 5250	Pass

			50	12.00	5240.01	5232 to 5248	Pass
802.11ac (VHT40)	MIMO	5190	20	10.20	5190.08	5174 to 5206	Pass
				12.00	5190.12	5174 to 5206	Pass
				13.80	5190.11	5174 to 5206	Pass
			-30	12.00	5190.05	5174 to 5206	Pass
			-20	12.00	5190.08	5150 to 5250	Pass
			-10	12.00	5190.04	5150 to 5250	Pass
			0	12.00	5190.08	5150 to 5250	Pass
			10	12.00	5190.05	5150 to 5250	Pass
			30	12.00	5190.10	5150 to 5250	Pass
			40	12.00	5190.09	5150 to 5250	Pass
			50	12.00	5190.09	5174 to 5206	Pass
		5230	20	10.20	5230.06	5214 to 5246	Pass
				12.00	5230.00	5214 to 5246	Pass
				13.80	5230.11	5214 to 5246	Pass
			-30	12.00	5230.05	5214 to 5246	Pass
			-20	12.00	5230.13	5150 to 5250	Pass
			-10	12.00	5230.09	5150 to 5250	Pass
			0	12.00	5230.08	5150 to 5250	Pass
			10	12.00	5230.01	5150 to 5250	Pass
			30	12.00	5230.04	5150 to 5250	Pass
			40	12.00	5230.01	5150 to 5250	Pass
			50	12.00	5230.00	5214 to 5246	Pass

Test Mode: 5.8G							
Mode	TX Type	Frequency (MHz)	Temperature (°C)	Voltage (VDC)	Measured Frequency (MHz)	Limit	Verdict
802.11a	SISO	5745	20	10.20	5745.02	5737 to 5753	Pass
				12.00	5745.12	5737 to 5753	Pass
				13.80	5745.01	5737 to 5753	Pass
			-30	10.20	5745.04	5737 to 5753	Pass
			-20	12.00	5745.08	5725 to 5850	Pass
			-10	12.00	5745.04	5725 to 5850	Pass
			0	12.00	5745.13	5725 to 5850	Pass
			10	12.00	5745.13	5725 to 5850	Pass
			30	12.00	5745.09	5725 to 5850	Pass
			40	12.00	5745.01	5725 to 5850	Pass
			50	12.00	5745.02	5737 to 5753	Pass
		5785	20	10.20	5785.10	5777 to 5793	Pass
				12.00	5785.11	5777 to 5793	Pass
				13.80	5785.13	5777 to 5793	Pass
			-30	10.20	5785.02	5777 to 5793	Pass
			-20	12.00	5785.06	5725 to 5850	Pass
			-10	12.00	5785.02	5725 to 5850	Pass
			0	12.00	5785.01	5725 to 5850	Pass
			10	12.00	5785.02	5725 to 5850	Pass
			30	12.00	5785.08	5725 to 5850	Pass
			40	12.00	5785.02	5725 to 5850	Pass
			50	12.00	5785.09	5777 to 5793	Pass
		5825	20	10.20	5825.05	5817 to 5833	Pass
				12.00	5825.03	5817 to 5833	Pass
				13.80	5825.07	5817 to 5833	Pass
			-30	10.20	5825.01	5817 to 5833	Pass
			-20	12.00	5825.03	5725 to 5850	Pass
			-10	12.00	5825.05	5725 to 5850	Pass
			0	12.00	5825.03	5725 to 5850	Pass
			10	12.00	5825.03	5725 to 5850	Pass
			30	12.00	5825.04	5725 to 5850	Pass
			40	12.00	5825.00	5725 to 5850	Pass
			50	12.00	5825.08	5817 to 5833	Pass
802.11n (HT20)	MIMO	5745	20	10.20	5745.07	5737 to 5753	Pass
				12.00	5745.09	5737 to 5753	Pass
				13.80	5745.12	5737 to 5753	Pass
			-30	10.20	5745.05	5737 to 5753	Pass
			-20	12.00	5745.03	5725 to 5850	Pass

			-10	12.00	5745.02	5725 to 5850	Pass
			0	12.00	5745.13	5725 to 5850	Pass
			10	12.00	5745.12	5725 to 5850	Pass
			30	12.00	5745.06	5725 to 5850	Pass
			40	12.00	5745.12	5725 to 5850	Pass
			50	12.00	5745.11	5737 to 5753	Pass
		5785	20	10.20	5785.08	5777 to 5793	Pass
				12.00	5785.10	5777 to 5793	Pass
				13.80	5785.00	5777 to 5793	Pass
			-30	10.20	5785.06	5777 to 5793	Pass
			-20	12.00	5785.04	5725 to 5850	Pass
			-10	12.00	5785.06	5725 to 5850	Pass
			0	12.00	5785.09	5725 to 5850	Pass
			10	12.00	5785.01	5725 to 5850	Pass
			30	12.00	5785.05	5725 to 5850	Pass
			40	12.00	5785.07	5725 to 5850	Pass
			50	12.00	5785.08	5777 to 5793	Pass
		5825	20	10.20	5825.09	5817 to 5833	Pass
				12.00	5825.10	5817 to 5833	Pass
				13.80	5825.05	5817 to 5833	Pass
			-30	10.20	5825.09	5817 to 5833	Pass
			-20	12.00	5825.11	5725 to 5850	Pass
			-10	12.00	5825.10	5725 to 5850	Pass
			0	12.00	5825.08	5725 to 5850	Pass
			10	12.00	5825.13	5725 to 5850	Pass
			30	12.00	5825.09	5725 to 5850	Pass
			40	12.00	5825.09	5725 to 5850	Pass
			50	12.00	5825.13	5817 to 5833	Pass
802.11n (HT40)	MIMO	5755	20	10.20	5755.00	5739 to 5771	Pass
				12.00	5755.06	5739 to 5771	Pass
				13.80	5755.02	5739 to 5771	Pass
			-30	10.20	5755.05	5739 to 5771	Pass
			-20	12.00	5755.08	5725 to 5850	Pass
			-10	12.00	5755.05	5725 to 5850	Pass
			0	12.00	5755.13	5725 to 5850	Pass
			10	12.00	5755.05	5725 to 5850	Pass
			30	12.00	5755.05	5725 to 5850	Pass
			40	12.00	5755.04	5725 to 5850	Pass
			50	12.00	5755.12	5739 to 5771	Pass
		5795	20	10.20	5795.10	5779 to 5811	Pass
				12.00	5795.06	5779 to 5811	Pass

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				13.80	5795.02	5779 to 5811	Pass
			-30	10.20	5795.06	5779 to 5811	Pass
			-20	12.00	5795.02	5725 to 5850	Pass
			-10	12.00	5795.13	5725 to 5850	Pass
			0	12.00	5795.10	5725 to 5850	Pass
			10	12.00	5795.06	5725 to 5850	Pass
			30	12.00	5795.01	5725 to 5850	Pass
			40	12.00	5795.02	5725 to 5850	Pass
			50	12.00	5795.08	5779 to 5811	Pass
802.11ac (VHT20)	MIMO	5745	20	10.20	5745.03	5737 to 5753	Pass
				12.00	5745.13	5737 to 5753	Pass
				13.80	5745.08	5737 to 5753	Pass
			-30	10.20	5745.01	5737 to 5753	Pass
			-20	12.00	5745.03	5725 to 5850	Pass
			-10	12.00	5745.13	5725 to 5850	Pass
			0	12.00	5745.12	5725 to 5850	Pass
			10	12.00	5745.09	5725 to 5850	Pass
			30	12.00	5745.06	5725 to 5850	Pass
			40	12.00	5745.04	5725 to 5850	Pass
			50	12.00	5745.10	5737 to 5753	Pass
		5785	20	10.20	5785.09	5777 to 5793	Pass
				12.00	5785.09	5777 to 5793	Pass
				13.80	5785.01	5777 to 5793	Pass
			-30	10.20	5785.12	5777 to 5793	Pass
			-20	12.00	5785.09	5725 to 5850	Pass
			-10	12.00	5785.07	5725 to 5850	Pass
			0	12.00	5785.05	5725 to 5850	Pass
			10	12.00	5785.07	5725 to 5850	Pass
			30	12.00	5785.10	5725 to 5850	Pass
			40	12.00	5785.06	5725 to 5850	Pass
			50	12.00	5785.00	5777 to 5793	Pass
		5825	20	10.20	5825.06	5817 to 5833	Pass
				12.00	5825.07	5817 to 5833	Pass
				13.80	5825.11	5817 to 5833	Pass
			-30	10.20	5825.07	5817 to 5833	Pass
			-20	12.00	5825.02	5725 to 5850	Pass
			-10	12.00	5825.09	5725 to 5850	Pass
			0	12.00	5825.05	5725 to 5850	Pass
			10	12.00	5825.05	5725 to 5850	Pass
			30	12.00	5825.02	5725 to 5850	Pass
			40	12.00	5825.10	5725 to 5850	Pass

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			50	12.00	5825.01	5817 to 5833	Pass
802.11ac (VHT40)	MIMO	5755	20	10.20	5755.11	5739 to 5771	Pass
				12.00	5755.09	5739 to 5771	Pass
				13.80	5755.12	5739 to 5771	Pass
			-30	10.20	5755.04	5739 to 5771	Pass
			-20	12.00	5755.08	5725 to 5850	Pass
			-10	12.00	5755.03	5725 to 5850	Pass
			0	12.00	5755.07	5725 to 5850	Pass
			10	12.00	5755.07	5725 to 5850	Pass
			30	12.00	5755.05	5725 to 5850	Pass
			40	12.00	5755.03	5725 to 5850	Pass
			50	12.00	5755.01	5739 to 5771	Pass
		5795	20	10.20	5795.04	5779 to 5811	Pass
				12.00	5795.08	5779 to 5811	Pass
				13.80	5795.03	5779 to 5811	Pass
			-30	10.20	5795.05	5779 to 5811	Pass
			-20	12.00	5795.11	5725 to 5850	Pass
			-10	12.00	5795.04	5725 to 5850	Pass
			0	12.00	5795.07	5725 to 5850	Pass
			10	12.00	5795.08	5725 to 5850	Pass
			30	12.00	5795.02	5725 to 5850	Pass
			40	12.00	5795.11	5725 to 5850	Pass
			50	12.00	5795.12	5779 to 5811	Pass

9. Antenna Requirement

9.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /15.407
Requirement	1) 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. 2) 15.407 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

9.2. Antenna Connected Construction

The antenna is a FPC Antenna which permanently attached, and the best case gain of the WIFI 5.2G: 2dBi & WiFi 5.8G: 2dBi. It complies with the standard requirement.

10. DFS(Dynamic Frequency Selection)

10.1. Test Standard and Requirement

The following table from FCC KDB905462 D02 UNII DFS Compliance procedures new rules list the applicable requirements for the DFS testing.

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

Master Devices:

a) The Master Device will use DFS in order to detect Radar Waveforms with received signal strength above the DFS Detection Threshold in the 5250~5350 MHz and 5470~5725 MHz bands. DFS is not required in the 5150~5250 MHz or 5725~5825 MHz bands.

b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Check for a specified time duration (Channel Availability Check Time) to ensure that there is no radar system operating on the Channel, using DFS described under subsection a) above.

c) The Master Device initiates a U-NII network by transmitting control signals that will enable other U-NII devices to Associate with the Master Device.

d) During normal operation, the Master Device will monitor the Channel (In-Service Monitoring) to ensure that there is no radar system operating on the Channel, using DFS described under a).

e) If the Master Device has detected a Radar Waveform during In-Service Monitoring as described under d), the Operating Channel of the U-NII network is no longer an Available Channel. The Master Device will instruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move Time. The transmissions during the Channel Move Time will be limited to the Channel Closing Transmission Time.

f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration of the Non-Occupancy Period.

g) If the Master Device delegates the In-Service Monitoring to a Client Device, then the combination will be tested to the requirements described under d) through f) above.

Client Devices:

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.

d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

Table 4: DFS Response Requirement Values

Paramenter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.	
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required facilitating a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

10.2. DFS Detection Thresholds

Table 5: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

10.3. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 5 Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a		60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-1	200-500	16-18	60%	30
4	11-	200-500	12-16	60%	30

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Aggregate (Radar Types 1-4)	80%	120

Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 μsec is selected, the number of pulses would be Round up $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{3066}\right)\right\}$ = Round up {17.2} = 18.

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

The parameters for this waveforms are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type wave forms, then each additional waveform must also be unique and not repeated from the previous waveforms.

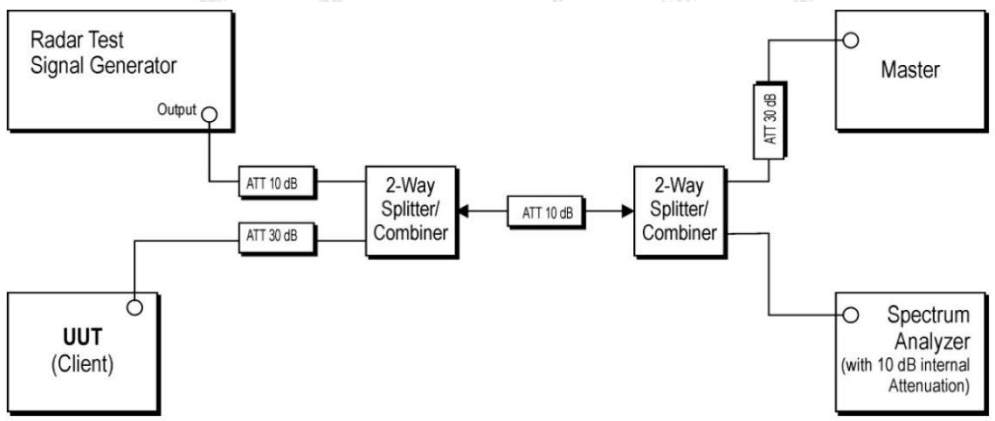
Table 7 – Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each wave form. The hopping sequence is different for each wave form and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250–5724MHz.Next,the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

10.4. Test Configuration



10.5. Test Procedure

a) A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master

b) The interference Radar Detection Threshold Level is -62dBm + 0dBi +1dB = -61dBm that had been taken into account the output power range and antenna gain.

c) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB.

d) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm + 0dBi +1dB = -61dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

e) When testing DFS, first set up the test channel in the router background, and then install iPerf software on EUT, so that EUT and router can communicate.

The time for the device to fully start up is 65s.

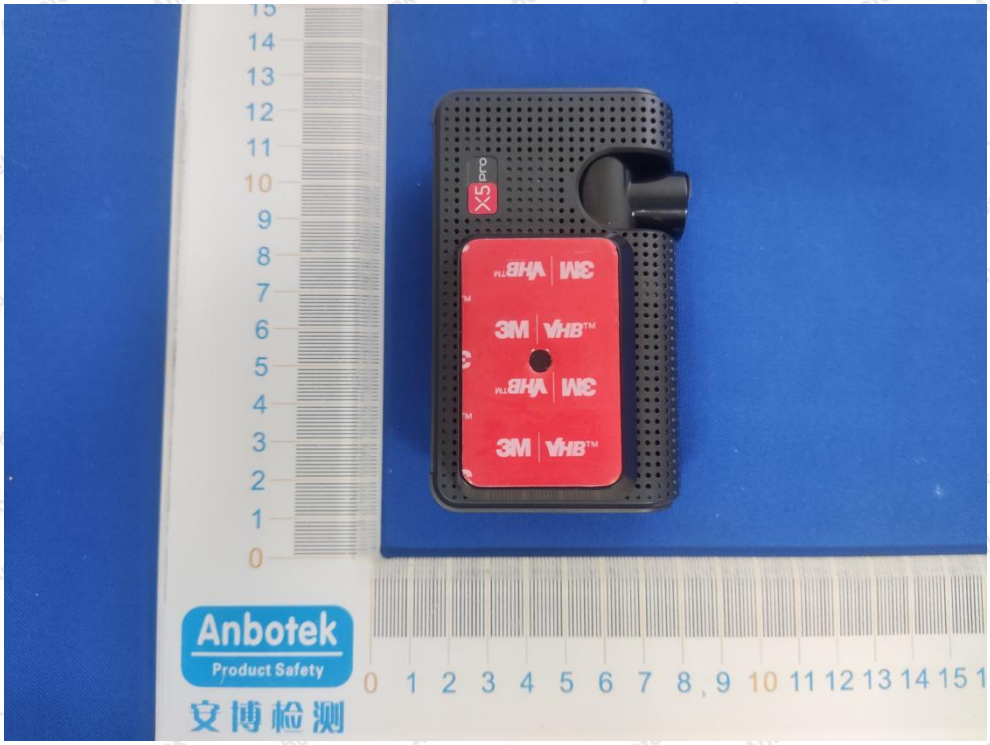
10.6. Test Data

Not applicable.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test

APPENDIX II -- EXTERNAL PHOTOGRAPH

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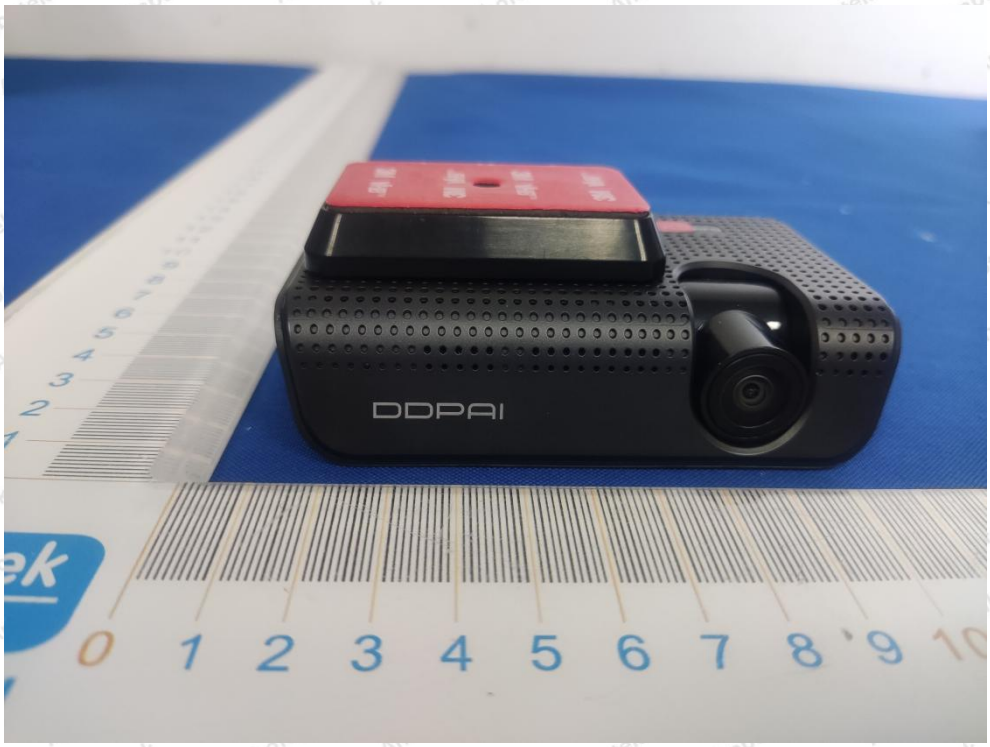
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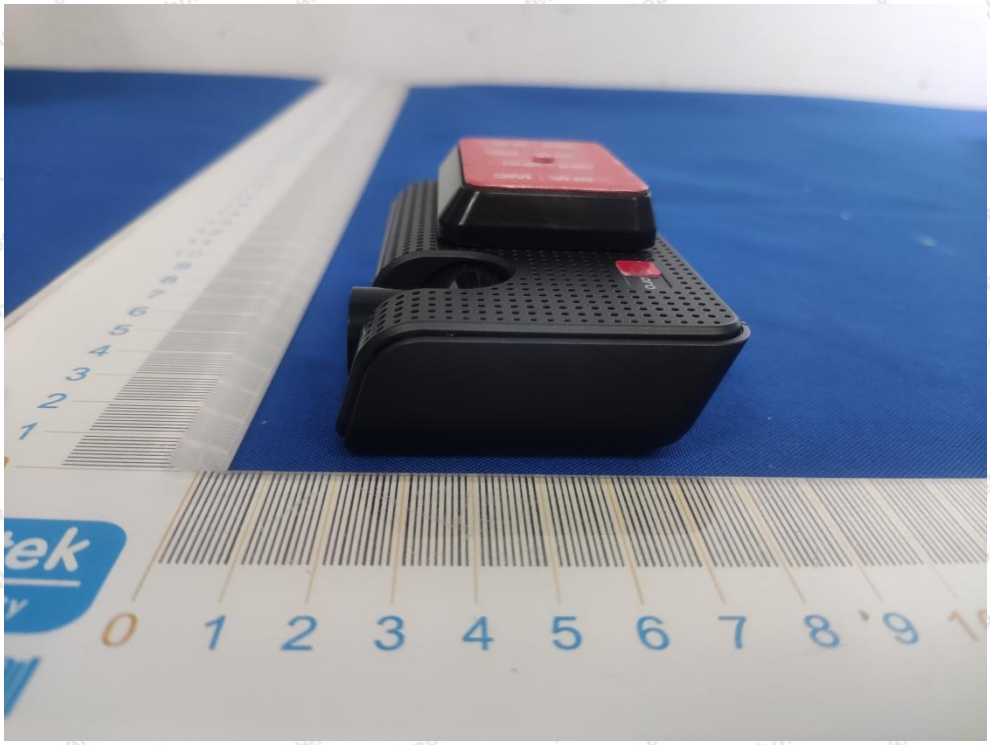


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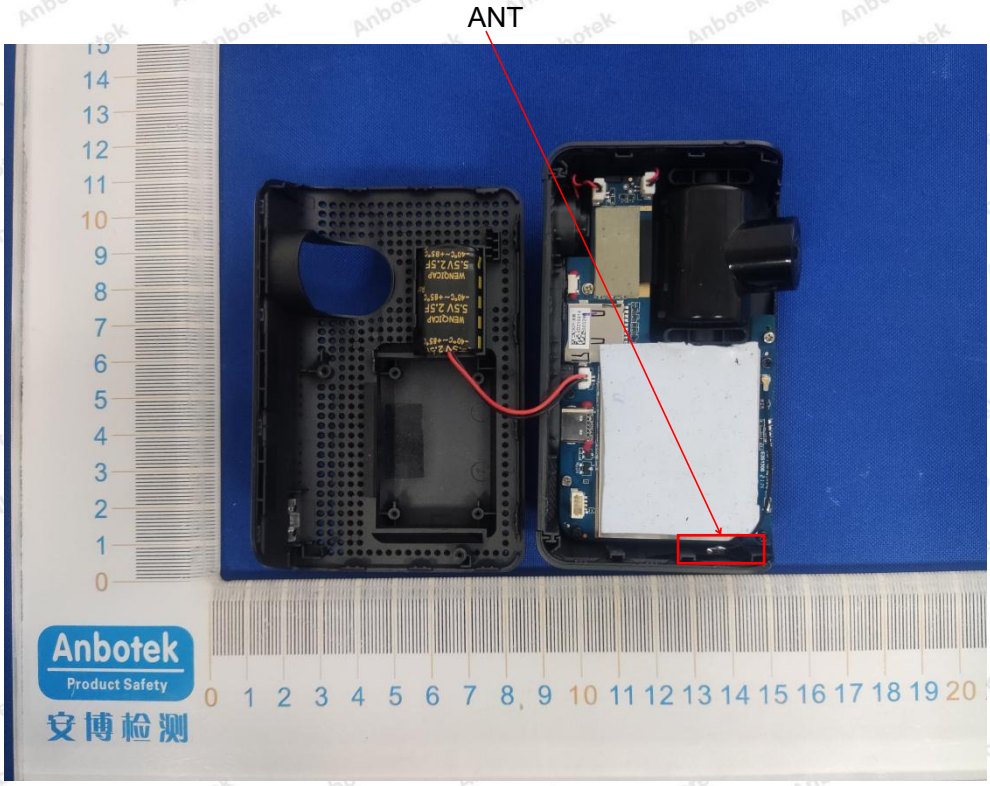
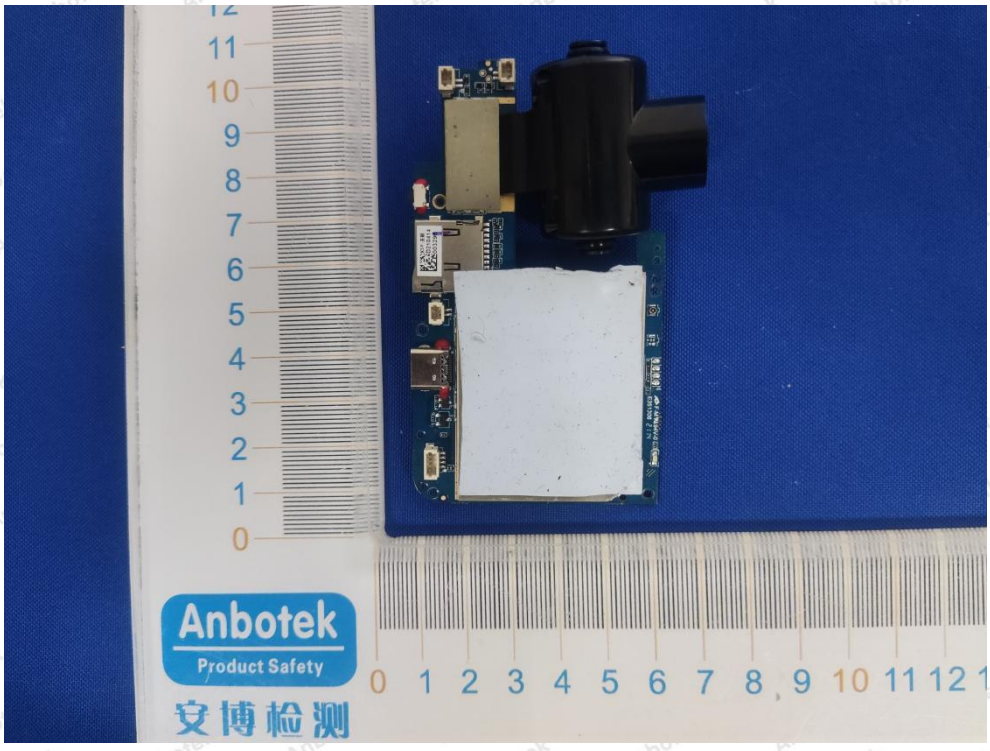
3M
0 1 2 3 4 5 6 7 8 9 10

APPENDIX III -- INTERNAL PHOTOGRAPH



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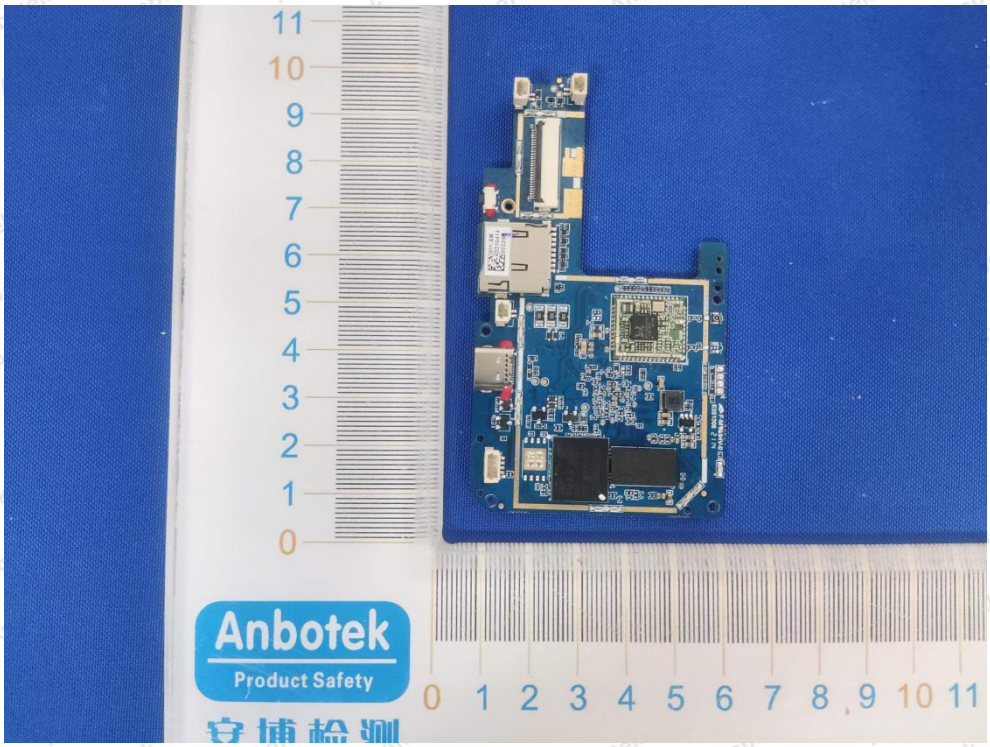
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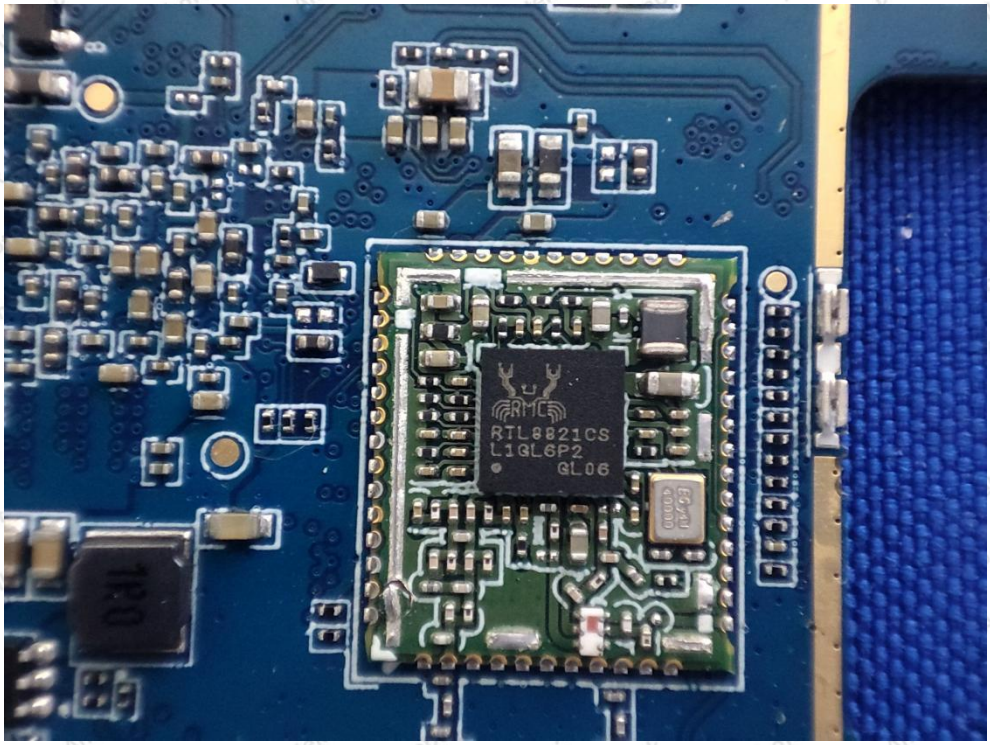
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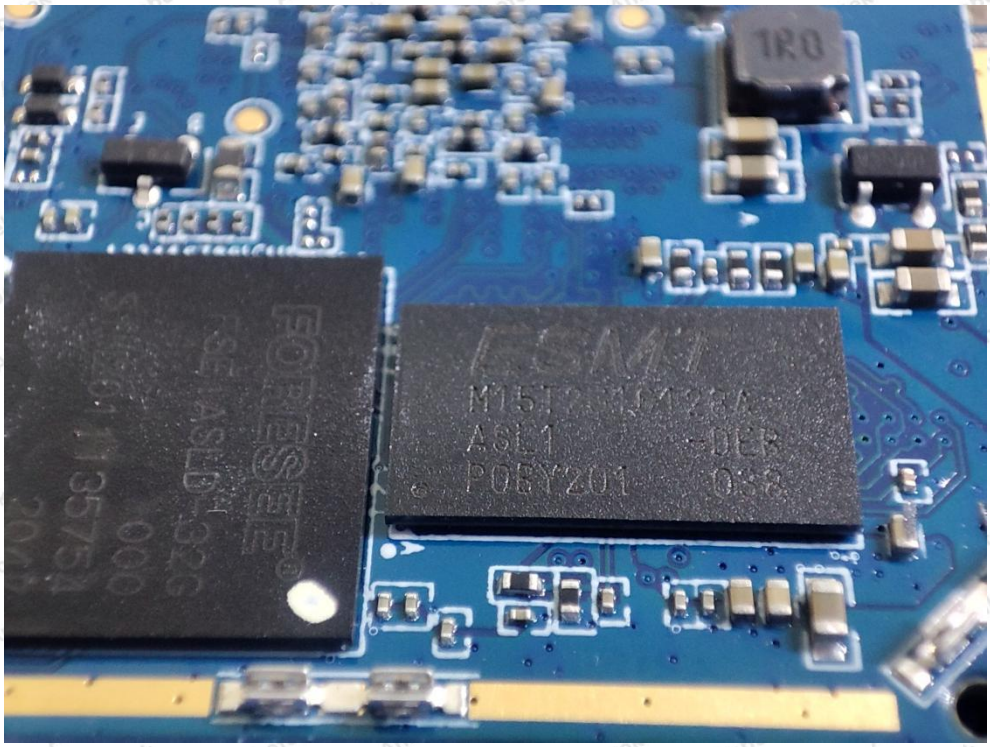

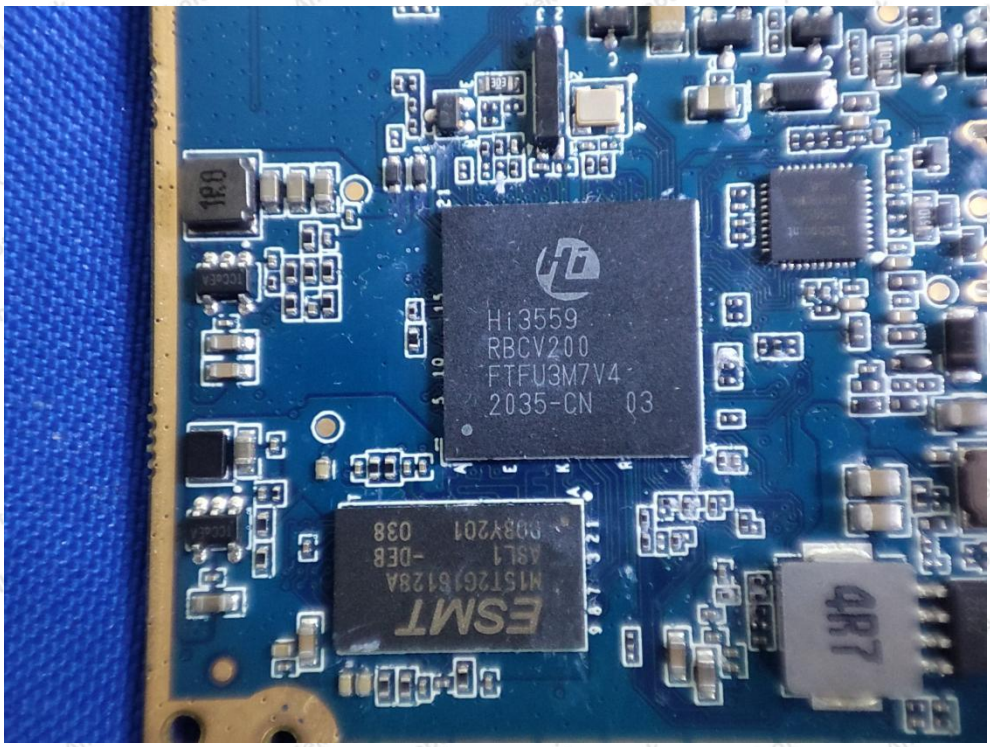
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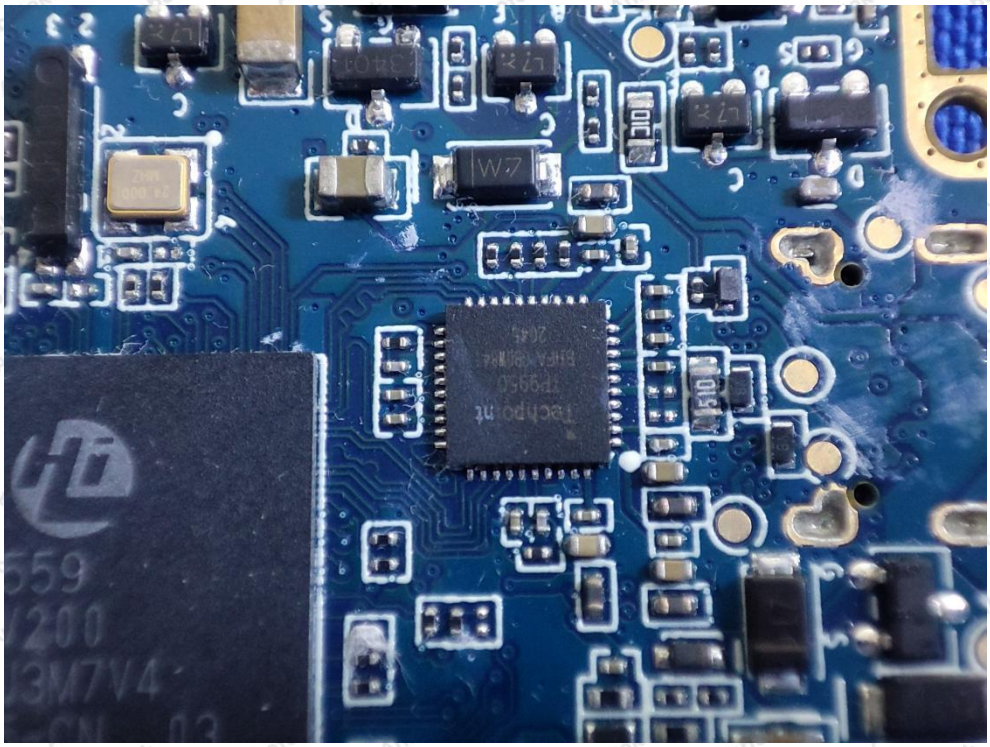
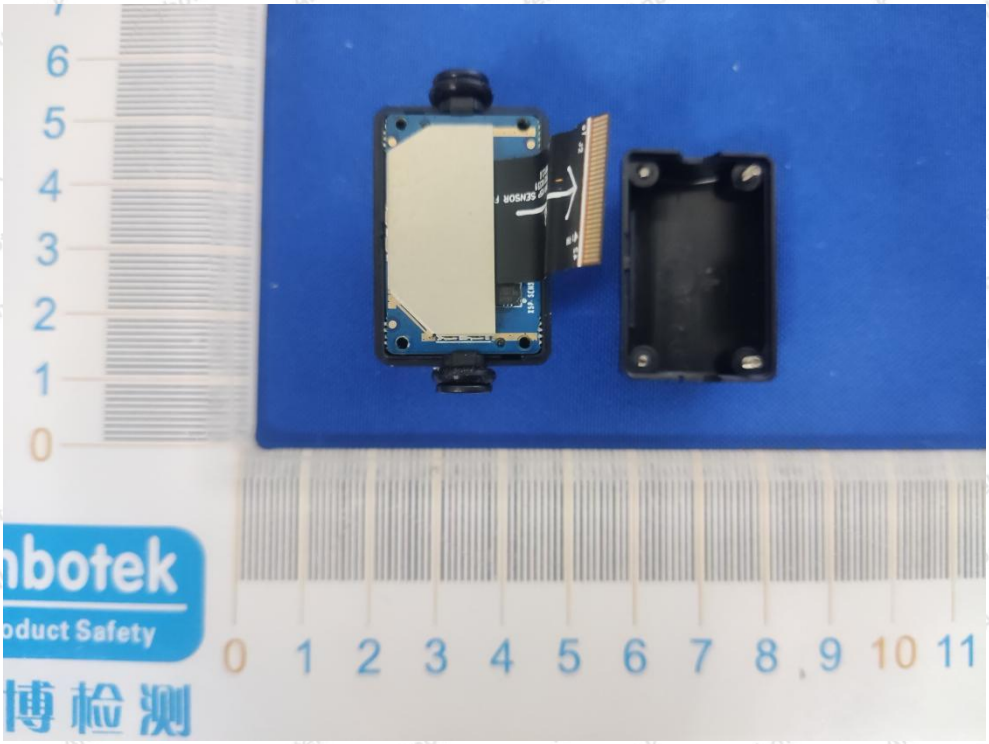
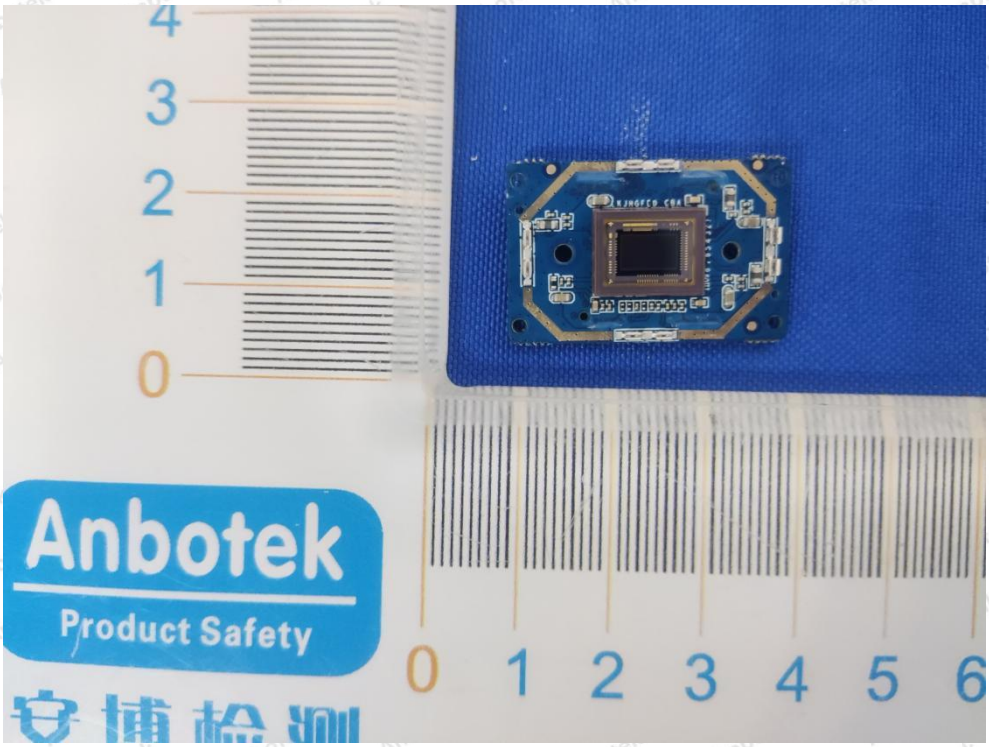
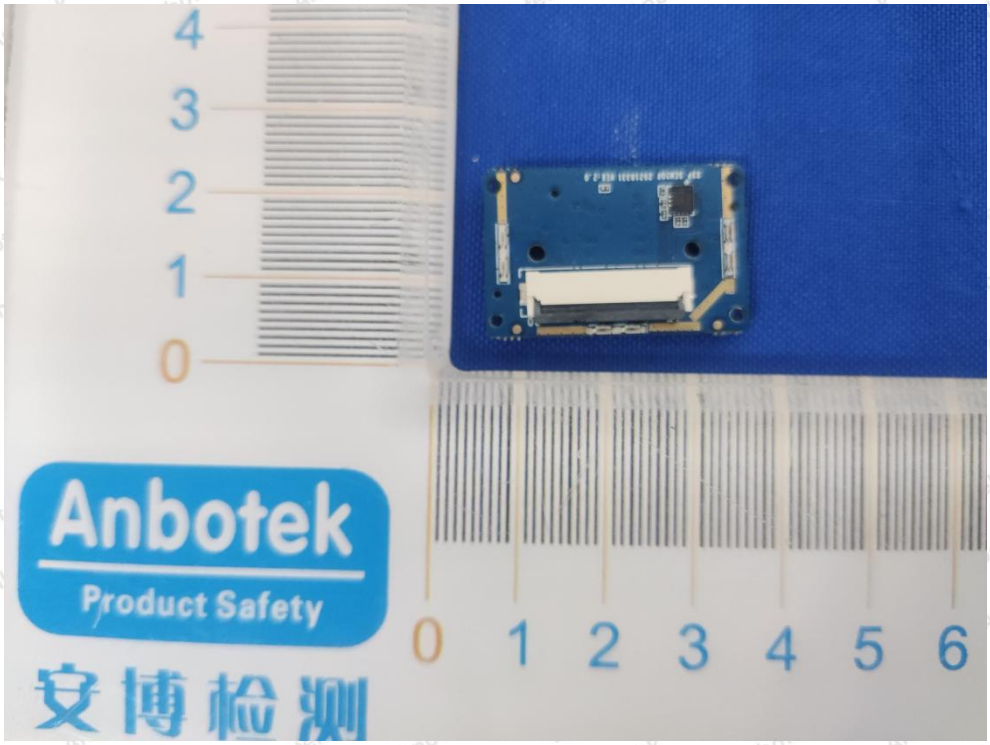
2035-CN 03
ESMT
4R7





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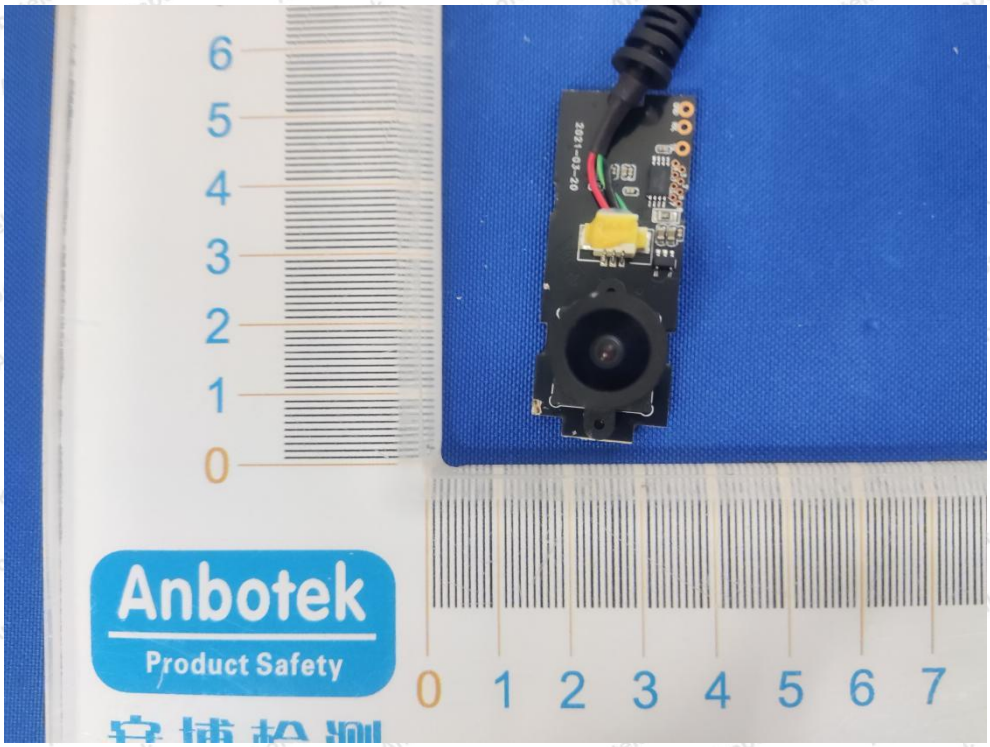
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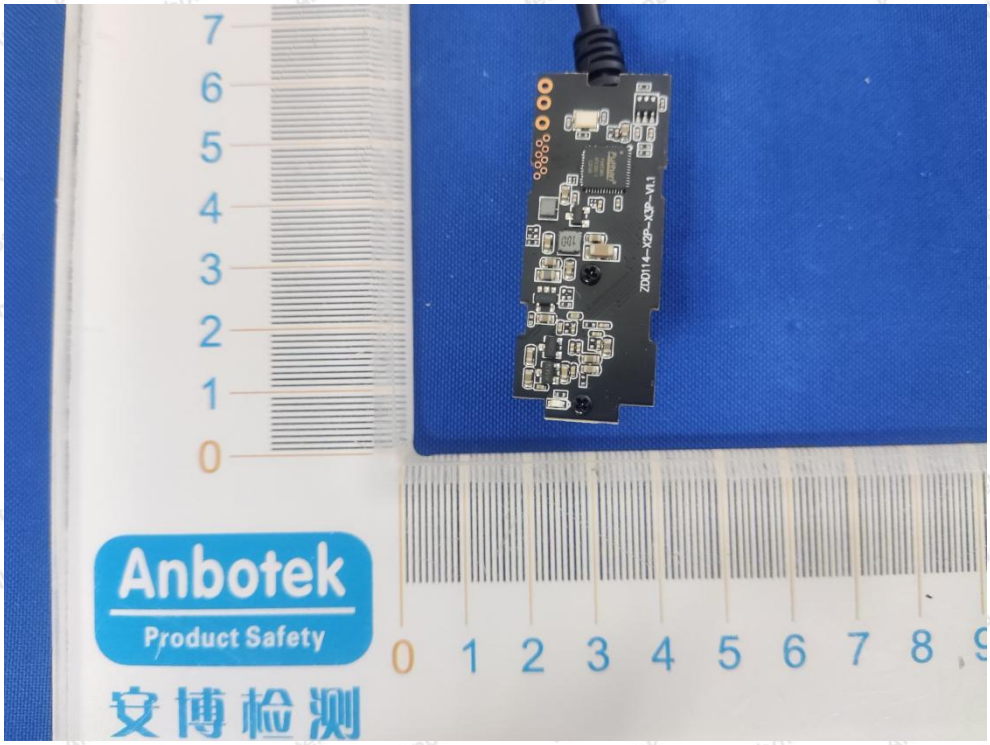
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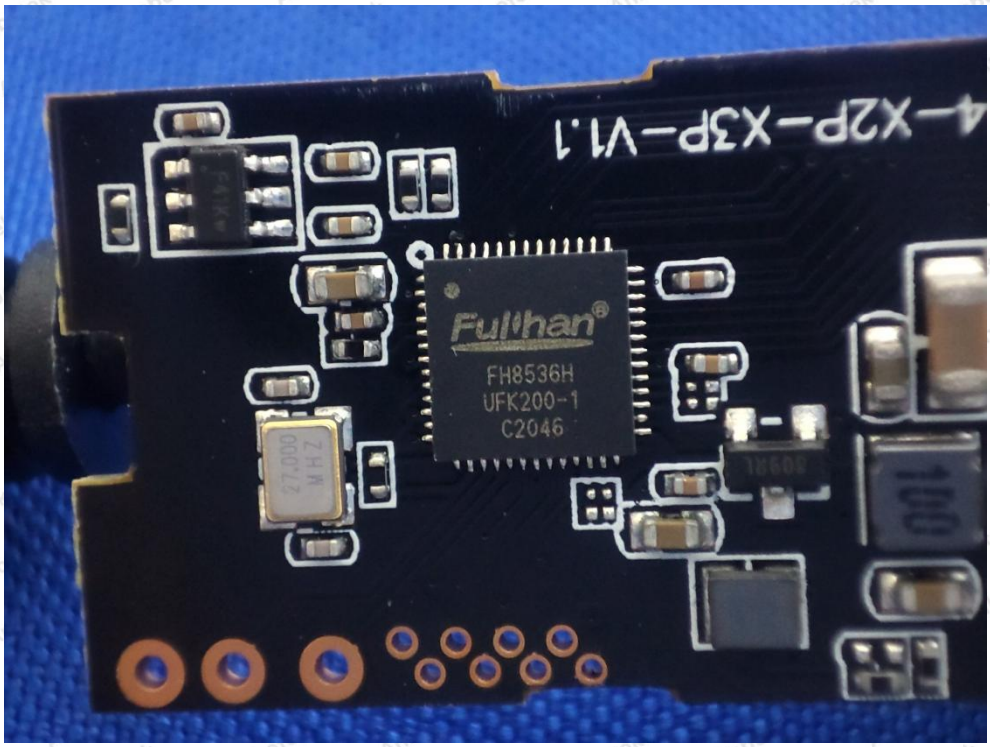
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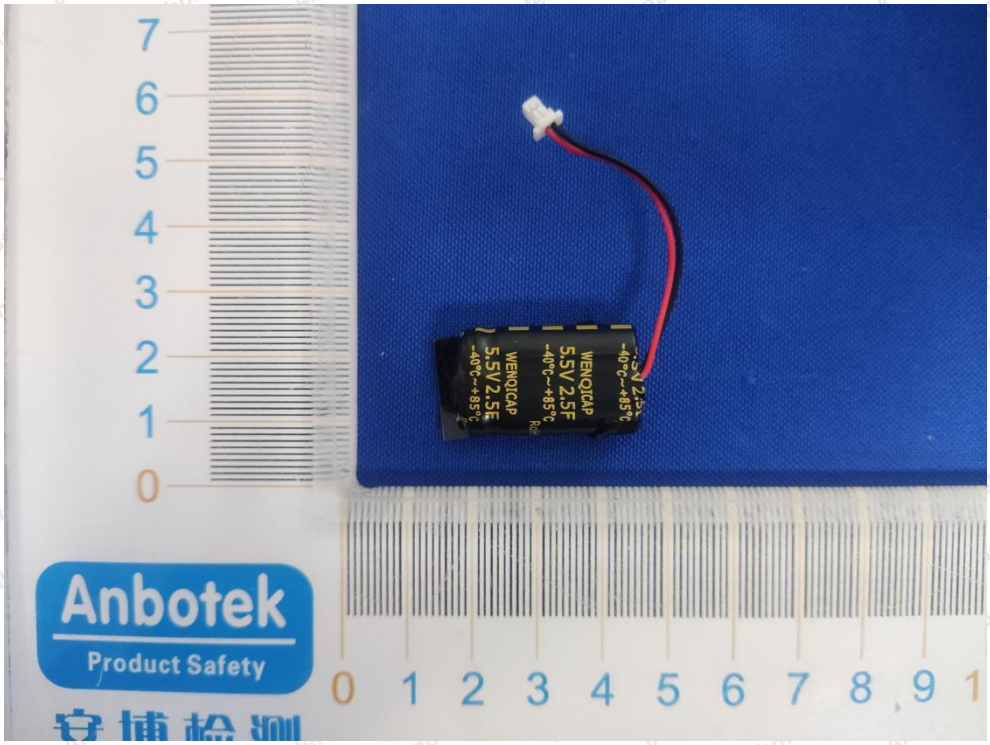
C2046


WENQICAP
5.5V 2.5F
-40°C~+85°C
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APPENDIX IV – Appendix Test Data