



# FCC Test Report

**Test Report  
On Behalf of  
Shenzhen Atongmu Technology Co., LTD  
For  
Projector**

**Model No.: AT-M269A, AT-M269B, AT-M269C, AT-M269D,  
ATM269E, AT-M269F, 269A, 269B, 269C, 269D, 269E, 269F, B269,  
QH270, QH271, QH272, QH273, QH274**

**FCC ID: 2BAAR-M269A**

**Prepared For :** Shenzhen Atongmu Technology Co., LTD  
Room 605, Office A Dong, Qiaohongsheng Wenhua Chuangyiyuan, Yintian  
Gongyequ, Yantian Shequ, Xixiang Jiedao, Baoan Qu, Shenzhen Shi, Guangdong,  
518000, China

**Prepared By :** Shenzhen HUAK Testing Technology Co., Ltd.  
1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping,  
Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

**Date of Test:** Jun. 28, 2024 ~ Jul. 09, 2024

**Date of Report:** Jul. 09, 2024

**Report Number:** HK2406283478-4E

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## Test Result Certification

**Applicant's Name** ..... : Shenzhen Atongmu Technology Co., LTD  
Address ..... : Room 605, Office A Dong, Qiaohongsheng Wenhua Chuangyiyuan, Yintian Gongyequ, Yantian Shequ, Xixiang Jiedao, Baoan Qu, Shenzhen Shi, Guangdong, 518000, China

**Manufacturer's Name** ..... : Shenzhen Atongmu Technology Co., LTD  
Address ..... : Room 605, Office A Dong, Qiaohongsheng Wenhua Chuangyiyuan, Yintian Gongyequ, Yantian Shequ, Xixiang Jiedao, Baoan Qu, Shenzhen Shi, Guangdong, 518000, China

### Product Description

Trade Mark ..... :



Product Name ..... : Projector

Model and/or Type Reference : AT-M269A, AT-M269B, AT-M269C, AT-M269D, ATM269E, AT-M269F, 269A, 269B, 269C, 269D, 269E, 269F, B269, QH270, QH271, QH272, QH273, QH274

**Standards** ..... : FCC Rules and Regulations Part 15 Subpart E Section 15.407  
ANSI C63.10: 2013

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HUAK Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HUAK 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.

**Date of Test** ..... :

Date (s) of performance of tests ..... : Jun. 28, 2024 ~ Jul. 09, 2024

Date of Issue ..... : Jul. 09, 2024

Test Result ..... : Pass

Testing Engineer

len liao

Len Liao

Technical Manager

Sliver Wan

Sliver Wan

Authorized Signatory

Jason Zhou

Jason Zhou

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## Table of Contents

<b>1. Test Result Summary .....</b>	<b>5</b>
1.1. Test Procedures and Results.....	5
1.2. Information of the Test Laboratory .....	5
1.3. Measurement Uncertainty .....	6
<b>2. EUT Description .....</b>	<b>7</b>
2.1. General Description of EUT .....	7
2.2. Operation Frequency Each of Channel.....	8
2.3. Operation of EUT during Testing.....	8
2.4. Description of Test Setup.....	9
2.5. Description of Support Units .....	10
<b>3. General Information.....</b>	<b>11</b>
3.1. Test Environment and Mode .....	11
<b>4. Test Results and Measurement Data .....</b>	<b>13</b>
4.1. Conducted Emission.....	13
4.2. Maximum Conducted Output Power .....	17
4.3. 6dB Emission Bandwidth .....	20
4.4. 26db Bandwidth and 99%Occupied Bandwidth.....	25
4.5. Power Spectral Density .....	26
4.6. Band Edge.....	31
4.7. Spurious Emission.....	40
4.8. Frequency Stability Measurement.....	53
4.9. Antenna Requirement.....	55
<b>5. Photographs of Test Setup .....</b>	<b>56</b>
<b>6. Photos of The EUT .....</b>	<b>58</b>

**\*\* Modified History \*\***

Revision	Description	Issued Date	Remark
Revision 1.0	Initial Test Report Release	Jul. 09, 2024	Jason Zhou

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 1. Test Result Summary

### 1.1. Test Procedures and Results

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a)	PASS
6dB Emission Bandwidth	§15.407(e)	PASS
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a)	N/A
Power Spectral Density	§15.407(a)	PASS
Band Edge	§15.407(b)/15.209/15.205	PASS
Radiated Emission	§15.407(b)/15.209/15.205	PASS
Frequency Stability	§15.407(g)	PASS

**Note:**

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

### 1.2. Information of the Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01.  
FCC Designation Number is CN1229.  
Canada IC CAB identifier is CN0045.  
CNAS Registration Number is L9589.



### 1.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	$\pm 0.37\text{dB}$
2	RF power, conducted	$\pm 3.35\text{dB}$
3	Spurious emissions, conducted	$\pm 2.20\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.90\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$



## 2. EUT Description

### 2.1. General Description of EUT

Equipment:	Projector
Model Name:	AT-M269A
Serial Model:	AT-M269B, AT-M269C, AT-M269D, ATM269E, AT-M269F, 269A, 269B, 269C, 269D, 269E, 269F, B269, QH270, QH274QH271, QH272, QH273
Model Difference:	All model's the function, software and electric circuit are the same, only with model named different. Test sample model: AT-M269A.
Trade Mark:	
FCC ID:	2BAAR-M269A
Operation Frequency:	IEEE 802.11a/n(HT20)5.745GHz-5.825GHz IEEE 802.11n(HT40)5.755GHz-5.795GHz
Modulation Technology:	IEEE 802.11a/n
Modulation Type:	64QAM,16QAM, QPSK, BPSK for OFDM
Antenna Type:	FPC Antenna
Antenna Gain:	2.91dBi
Power Source:	AC 100-240V 50/60Hz
Power Supply:	AC 100-240V 50/60Hz
Hardware Version:	RT6710-ATM-269-V1.0
Software Version:	RTL8733BU WiFi linux v5.130.1-112-g10248f4f3 COEX20230616-330e.20230703.tar

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 2.2. Operation Frequency Each of Channel

802.11a/802.11n(HT20)		802.11n(HT40)	
Channel	Frequency	Channel	Frequency
149	5745	151	5755
153	5765	159	5790
157	5785		
161	5805		
165	5825		

**Note:**

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

## 2.3. Operation of EUT during Testing

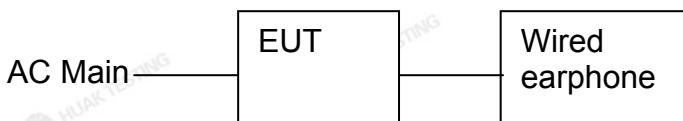
Band IV (5725 - 5850 MHz)		
For 802.11a/n (HT20)		
Channel Number	Channel	Frequency (MHz)
149	Low	5745
157	Mid	5785
165	High	5825

For 802.11n (HT40)		
Channel Number	Channel	Frequency (MHz)
151	Low	5755
159	High	5795

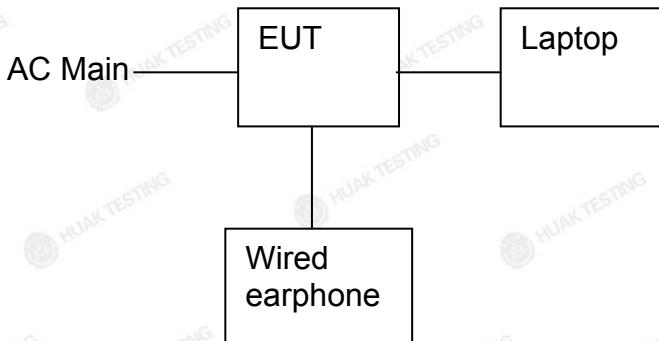


## 2.4. Description of Test Setup

Operation of EUT during radiation testing:



Operation of EUT during conducted testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position.



## 2.5. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Note
1	Projector		AT-M269A	N/A	EUT
2	Laptop	Lenovo	Thinkpad E450	Input: 20V 2.25A/3.25A	Peripheral
3	Wired earphone	N/A	N/A	N/A	Peripheral

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

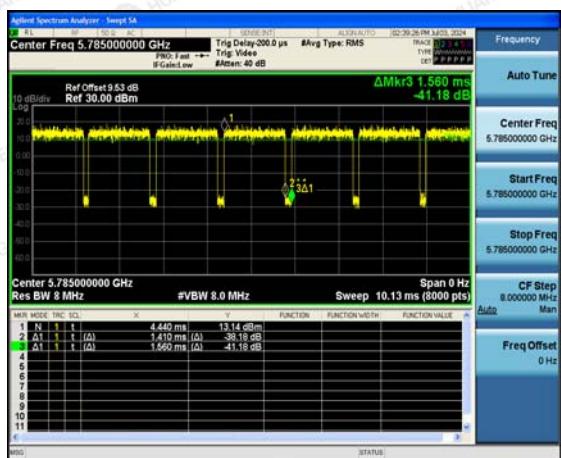
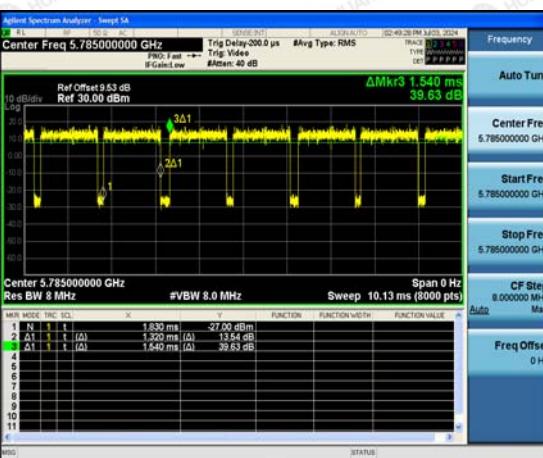
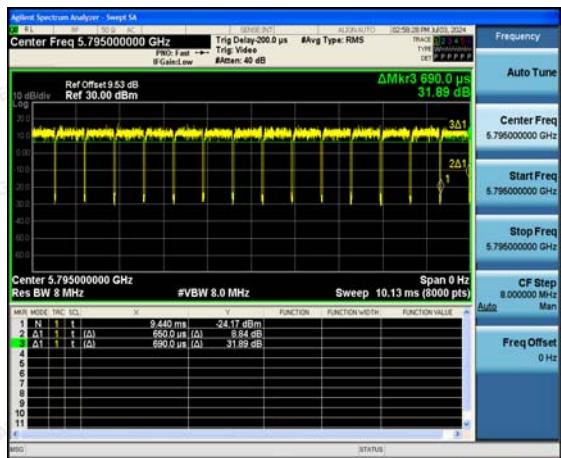


### 3. General Information

#### 3.1. Test Environment and Mode

<b>Operating Environment:</b>				
Temperature:	25.0 °C			
Humidity:	56 % RH			
Atmospheric Pressure:	1010 mbar			
<b>Test Mode:</b>				
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations			
We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:				
<b>Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.</b>				
Mode	Data rate			
802.11a	6 Mbps			
802.11n(HT20)	MCS0			
802.11n(HT40)	MCS0			
<b>Final Test Mode:</b>				
Operation mode:	Keep the EUT in continuous transmitting with modulation			
<b>Mode Test Duty Cycle:</b>				
Mode	Duty Cycle	Duty Cycle Factor (dB)		
802.11a	0.904	-0.439		
802.11n(HT20)	0.857	-0.669		
802.11n(HT40)	0.942	-0.259		

Test plots as follows:

**802.11a****802.11n(HT20)****802.11n(HT40)**



## 4. Test Results and Measurement Data

### 4.1. Conducted Emission

#### 4.1.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.207																	
<b>Test Method:</b>	ANSI C63.10:2013																	
<b>Frequency Range:</b>	150 kHz to 30 MHz																	
<b>Receiver Setup:</b>	RBW=9 kHz, VBW=30 kHz, Sweep time=auto																	
<b>Limits:</b>	<table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th></th> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>			Frequency range (MHz)	Limit (dBuV)			Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																	
	Quasi-peak	Average																
0.15-0.5	66 to 56*	56 to 46*																
0.5-5	56	46																
5-30	60	50																
<b>Test Setup:</b>	<p>Reference Plane</p> <p>40cm</p> <p>E.U.T</p> <p>AC power</p> <p>LISN</p> <p>Filter</p> <p>AC power</p> <p>Test table/Insulation plane</p> <p>EMI Receiver</p> <p>Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>																	
<b>Test Mode:</b>	Transmitting with modulation																	
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li> <li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.</li> </ol>																	
<b>Test Result:</b>	PASS																	

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>



#### 4.1.2. Test Instruments

##### Conducted Emission Shielding Room Test Site (843)

Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Receiver	R&S	ESR	HKE-005	Feb. 20, 2024	Feb. 19, 2025
LISN	R&S	ENV216	HKE-002	Feb. 20, 2024	Feb. 19, 2025
LISN	R&S	ENV216	HKE-059	Feb. 20, 2024	Feb. 19, 2025
Coax cable (9KHz-30MHz)	Times	381806-002	N/A	Feb. 20, 2024	Feb. 19, 2025
EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	N/A	N/A
10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	Feb. 20, 2024	Feb. 19, 2025

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

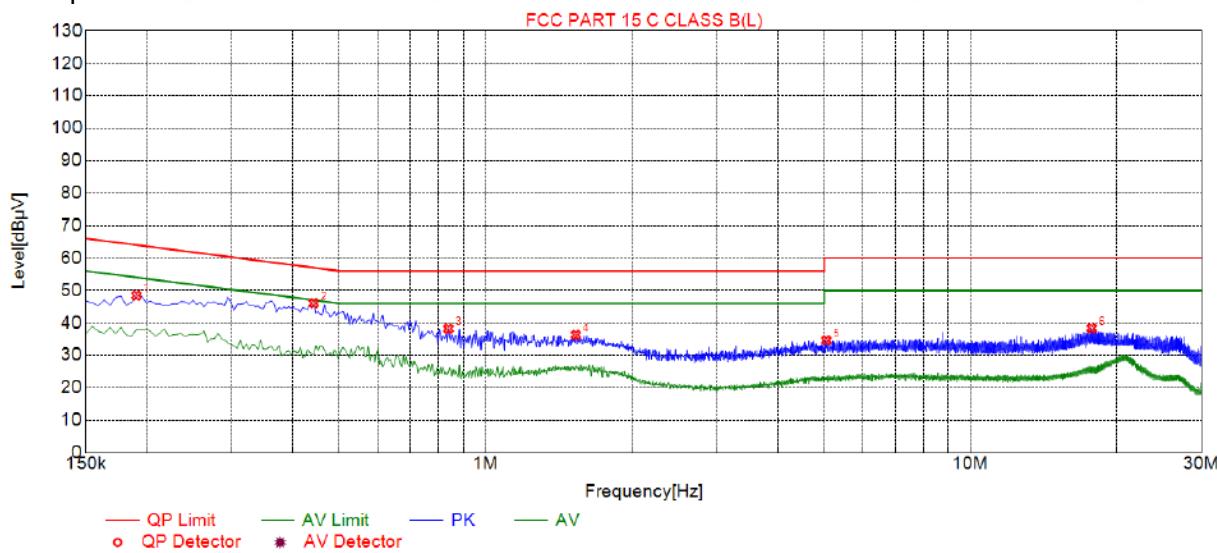


### 4.1.3. Test data

#### Test data

All modes have been tested, only the worst mode of 802.11a is reflected.

Test Specification: Line



### Suspected List

NO.	Freq. [MHz]	Level [dB $\mu$ V]	Factor [dB]	Limit [dB $\mu$ V]	Margin [dB]	Reading [dB $\mu$ V]	Detector	Type
1	0.1905	48.44	19.84	64.01	15.57	28.60	PK	L
2	0.4425	46.08	19.85	57.01	10.93	26.23	PK	L
3	0.8385	38.21	19.87	56.00	17.79	18.34	PK	L
4	1.5360	36.32	19.93	56.00	19.68	16.39	PK	L
5	5.0460	34.64	20.11	60.00	25.36	14.53	PK	L
6	17.7945	38.36	19.85	60.00	21.64	18.51	PK	L

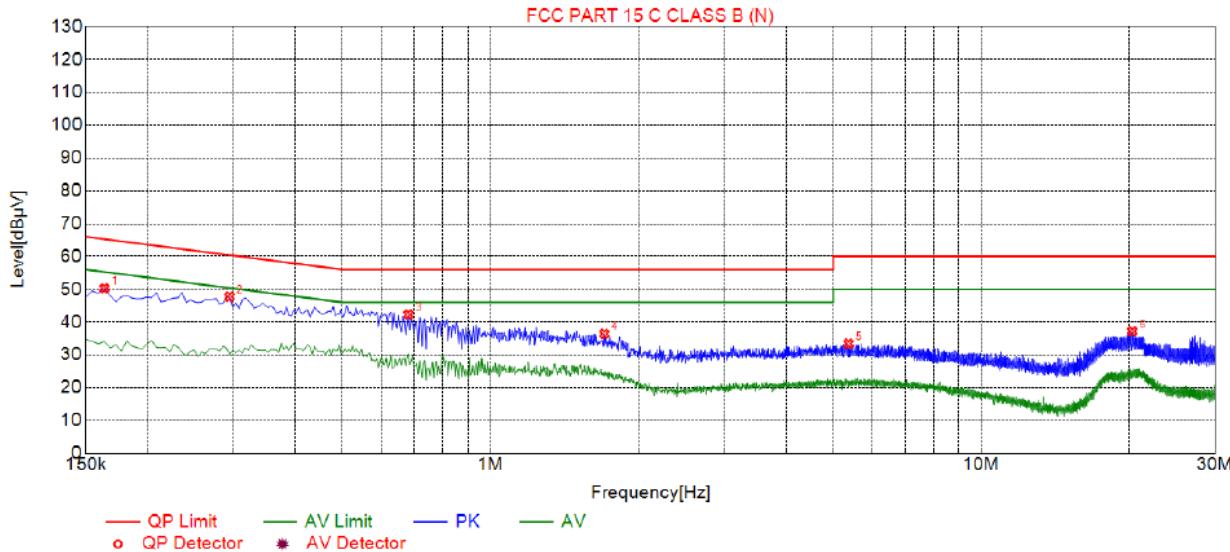
Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor



Test Specification: Neutral



### Suspected List

NO.	Freq. [MHz]	Level [dB $\mu$ V]	Factor [dB]	Limit [dB $\mu$ V]	Margin [dB]	Reading [dB $\mu$ V]	Detector	Type
1	0.1635	50.30	19.68	65.28	14.98	30.62	PK	N
2	0.2940	47.76	19.73	60.41	12.65	28.03	PK	N
3	0.6810	42.32	19.74	56.00	13.68	22.58	PK	N
4	1.7070	36.41	19.82	56.00	19.59	16.59	PK	N
5	5.3655	33.43	20.00	60.00	26.57	13.43	PK	N
6	20.3415	37.20	20.01	60.00	22.80	17.19	PK	N

Remark: Margin = Limit – Level

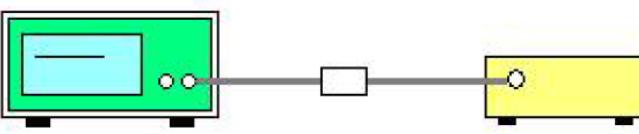
Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor



## 4.2. Maximum Conducted Output Power

### 4.2.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 E Section 15.407(a)	
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v02.r01 Section E	
<b>Limit:</b>	Frequency Band (MHz)	Limit
	5725-5850	1 W
<b>Test Setup:</b>	 <p><b>Power meter</b>   <b>EUT</b></p>	
<b>Test Mode:</b>	Transmitting mode with modulation	
<b>Test Procedure:</b>	<ol style="list-style-type: none"><li>1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E, 3, a.</li><li>2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li><li>3. Set to the maximum power setting and enable the EUT transmit continuously.</li><li>4. Measure the conducted output power and record the results in the test report.</li></ol>	
<b>Test Result:</b>	PASS	
<b>Remark:</b>	Conducted output power= measurement power + $10\log(1/x)$ X is duty cycle=1, so $10\log(1/1)=0$ Conducted output power= measurement power	

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>



#### 4.2.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	Feb. 19, 2025
Power meter	Agilent	E4419B	HKE-085	Feb. 20, 2024	Feb. 19, 2025
Power Sensor	Agilent	E9300A	HKE-086	Feb. 20, 2024	Feb. 19, 2025
RF cable	Times	1-40G	HKE-034	Feb. 20, 2024	Feb. 19, 2025
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 20, 2024	Feb. 19, 2025
RF Test Software	Tonscend	JS1120-3 Version 3.3.23	HKE-083	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**Test Data**

Configuration Band IV (5745 - 5825 MHz )				
Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
802.11a	CH149	9.51	30	PASS
802.11a	CH157	10.13	30	PASS
802.11a	CH165	10.66	30	PASS
802.11n(HT20)	CH149	9.15	30	PASS
802.11n(HT20)	CH157	9.41	30	PASS
802.11n(HT20)	CH165	9.81	30	PASS
802.11n(HT40)	CH151	8.48	30	PASS
802.11n(HT40)	CH159	9.03	30	PASS

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



### 4.3. 6dB Emission Bandwidth

#### 4.3.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15 Section 15.407(e)
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C
<b>Limit:</b>	>500kHz
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                   <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	PASS

#### 4.3.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	Feb. 19, 2025
RF cable	Times	1-40G	HKE-034	Feb. 20, 2024	Feb. 19, 2025
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 20, 2024	Feb. 19, 2025
RF Test Software	Tonscend	JS1120-3 Version 3.3.23	HKE-083	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**4.3.3. Test data**

<b>Band IV (5745 - 5825 MHz )</b>					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	CH149	5745	15.040	0.5	PASS
802.11a	CH157	5785	15.080	0.5	PASS
802.11a	CH165	5825	15.040	0.5	PASS
802.11n(HT20)	CH149	5745	15.080	0.5	PASS
802.11n(HT20)	CH157	5785	15.040	0.5	PASS
802.11n(HT20)	CH165	5825	13.840	0.5	PASS
802.11n(HT40)	CH151	5755	31.280	0.5	PASS
802.11n(HT40)	CH159	5795	31.280	0.5	PASS

**Test plots as follows:**

## Band IV (5725 – 5850 MHz)

802.11a



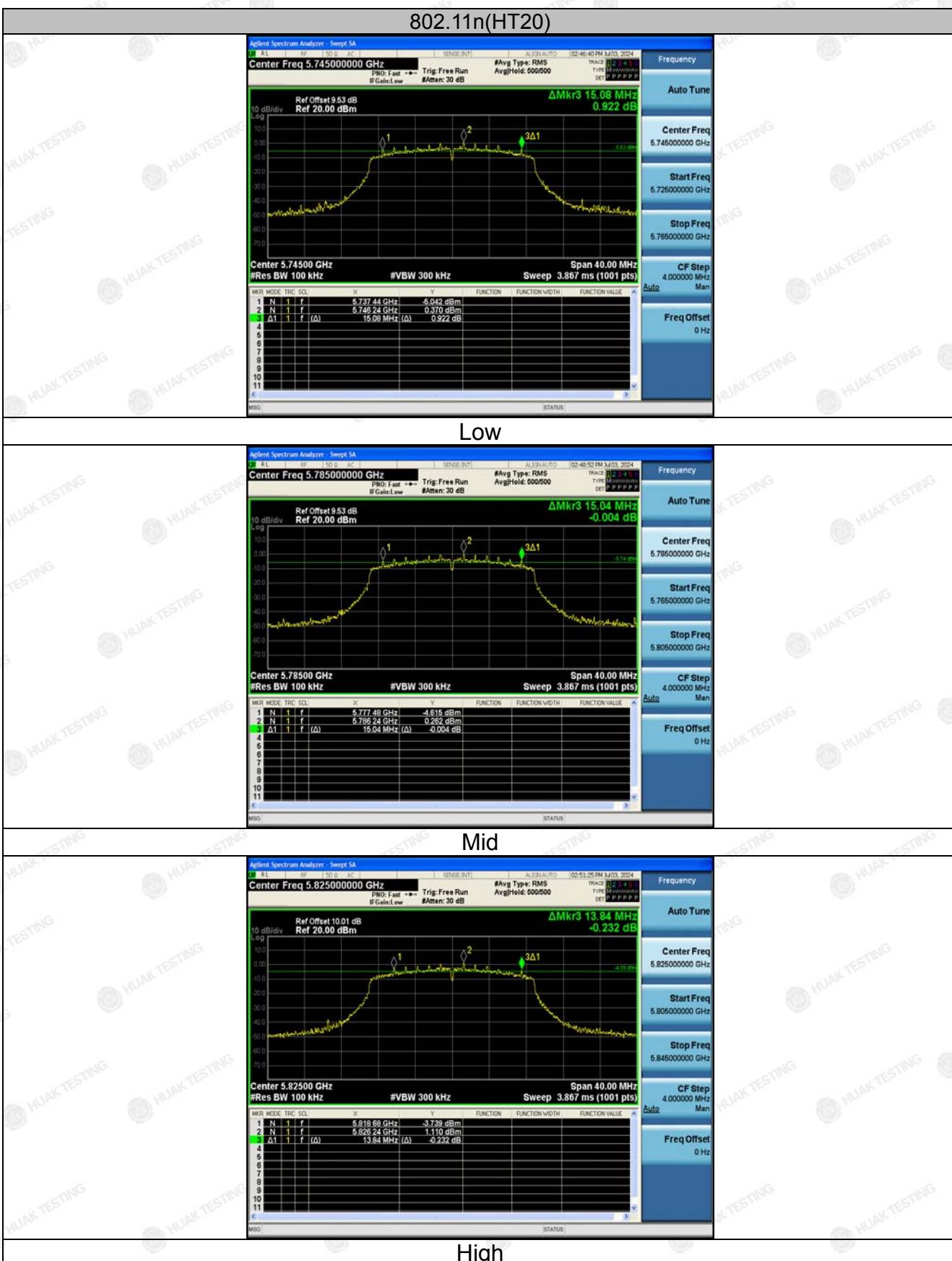
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 802.11n(HT20)





## 802.11n(HT40)



Low

High

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

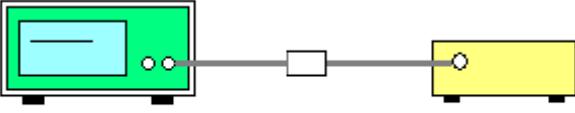
TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 4.4. 26db Bandwidth and 99%Occupied Bandwidth

### 4.4.1. Test Specification

<b>Test Requirement:</b>	47 CFR Part 15C Section 15.407 (a)
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
<b>Limit:</b>	No restriction limits
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>                                   <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C.</li> <li>2. Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>3. Make the measurement with the spectrum analyzer's resolution bandwidth RBW = 1% EBW, VBW<math>\geq</math>3RBW, In order to make an accurate measurement.</li> <li>4. Measure and record the results in the test report.</li> </ol>
<b>Test Result:</b>	N/A

### 4.4.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	Feb. 19, 2025
RF cable	Times	1-40G	HKE-034	Feb. 20, 2024	Feb. 19, 2025
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 20, 2024	Feb. 19, 2025
RF Test Software	Tonscend	JS1120-3 Version 3.3.23	HKE-083	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

### 4.4.3. Test Result

N/A

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

## 4.5. Power Spectral Density

#### 4.5.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 E Section 15.407 (a)
<b>Test Method:</b>	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
<b>Limit:</b>	$\leq 30.00 \text{dBm}/500\text{KHz}$ for Band IV 5725MHz-5850MHz
<b>Test Setup:</b>	 <p style="text-align: center;"><b>Spectrum Analyzer</b>   <b>EUT</b></p>
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"> <li>1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.</li> <li>2. Set RBW = 510 kHz/1 MHz, VBW <math>\geq 3 \times \text{RBW}</math>, Sweep time = Auto, Detector = RMS.</li> <li>3. Allow the sweeps to continue until the trace stabilizes.</li> <li>4. Use the peak marker function to determine the maximum amplitude level.</li> <li>5. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.</li> </ol>
<b>Test Result:</b>	PASS

#### 4.5.2. Test Instruments

RF Test Room					
Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	Feb. 19, 2025
RF cable	Times	1-40G	HKE-034	Feb. 20, 2024	Feb. 19, 2025
RF automatic control unit	Tonscend	JS0806-2	HKE-060	Feb. 20, 2024	Feb. 19, 2025
RF Test Software	Tonscend	JS1120-3 Version 3.3.23	HKE-083	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



#### 4.5.3. Test data

Configuration Band IV (5745 - 5825 MHz)						
Mode	Test channel	Level [dBm/510kHz]	10log (500/510)	Power Spectral Density	Limit (dBm/500kHz)	Result
802.11a	CH149	3.66	-0.086	3.574	30	PASS
802.11a	CH157	4.51	-0.086	4.424	30	PASS
802.11a	CH165	5.26	-0.086	5.174	30	PASS
802.11nHT20	CH149	3.73	-0.086	3.644	30	PASS
802.11n HT20	CH157	4.05	-0.086	3.964	30	PASS
802.11nHT20	CH165	3.64	-0.086	3.554	30	PASS
802.11nHT40	CH151	-0.06	-0.086	-0.146	30	PASS
802.11nHT40	CH159	0.37	-0.086	0.284	30	PASS

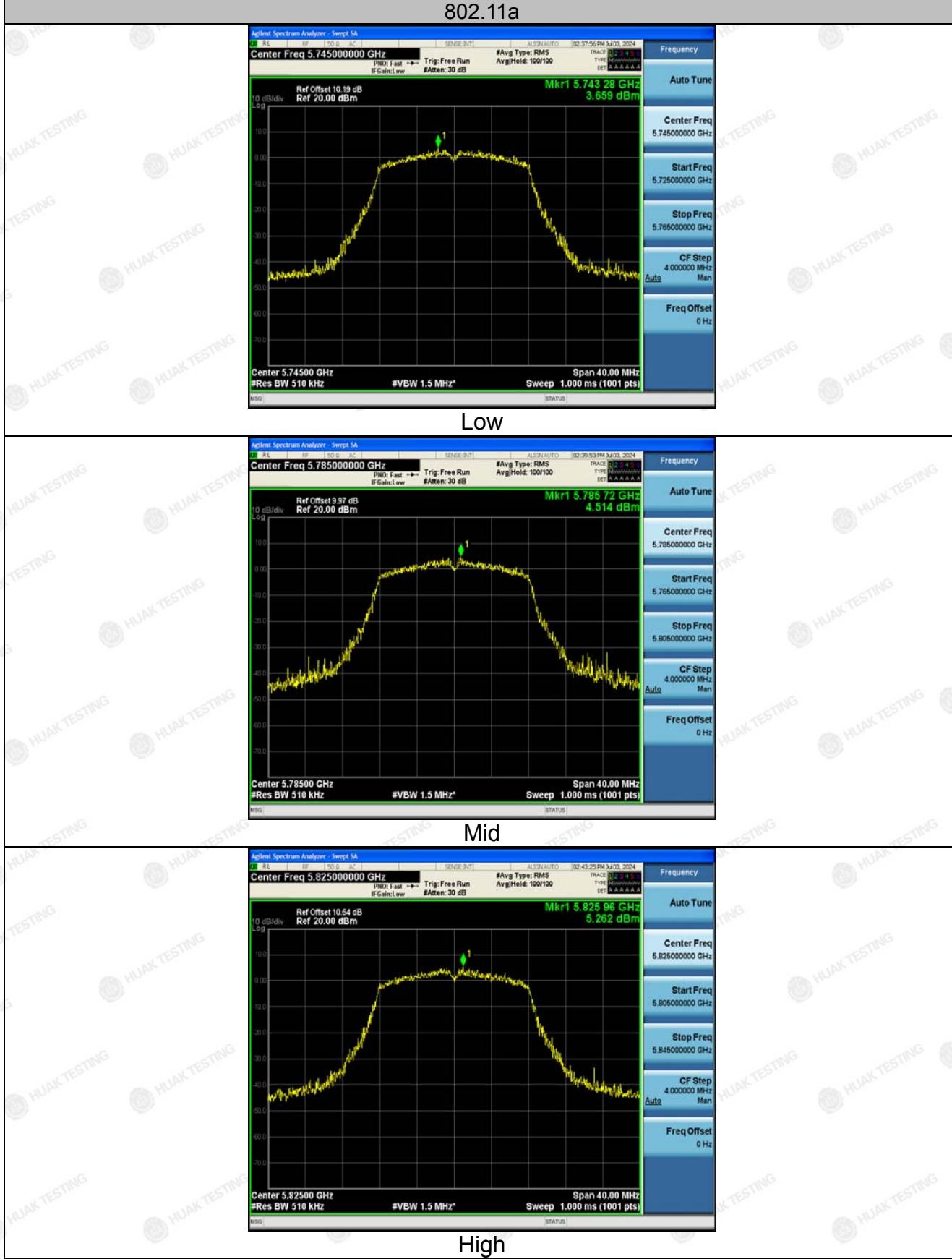
**Note:** Power Spectral Density= Level [dBm/510kHz]+(10log(Limit RBW/Test RBW))

Test plots as follows:



Band IV (5725-5850 MHz)

802.11a



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 802.11n(HT20)



Low



Mid



High

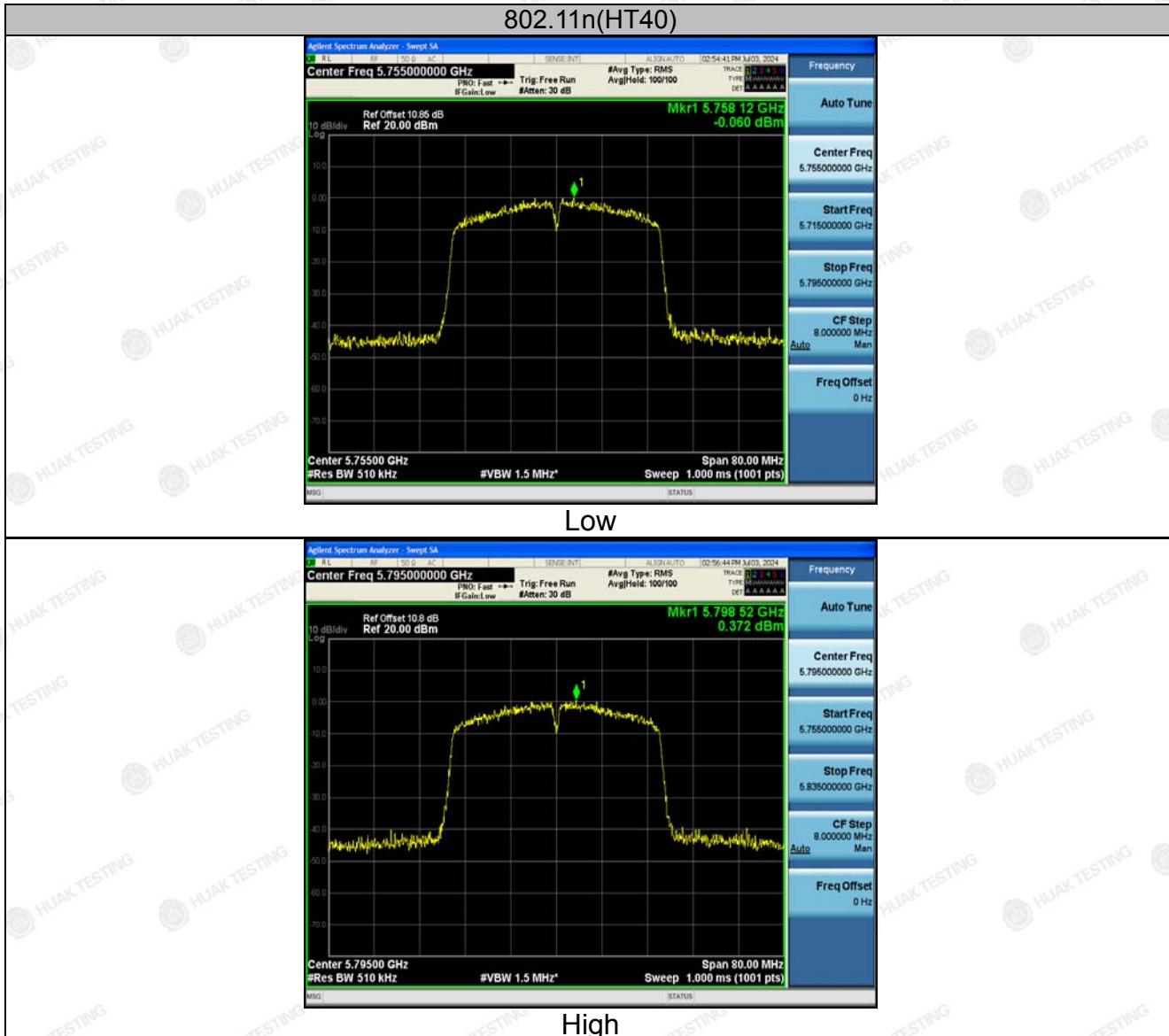
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 802.11n(HT40)



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>.

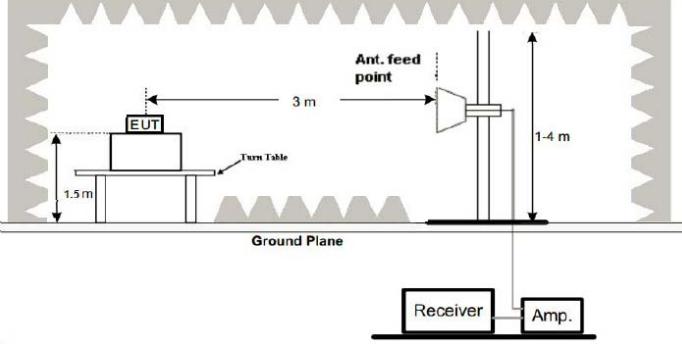
TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 4.6. Band Edge

### 4.6.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15E Section 15.407
<b>Test Method:</b>	ANSI C63.10 2013
<b>Limit:</b>	(1) For transmitters operating in the 5.725-5.85 GHz band: (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. The limit of frequency below 1GHz and which fall in restricted bands should complies 15.209.
<b>Test Setup:</b>	
<b>Test Mode:</b>	Transmitting mode with modulation
<b>Test Procedure:</b>	<ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li></ol>

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>



	6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi peak or average method as specified and then reported in a data sheet.
<b>Test Result:</b>	PASS



#### 4.6.2. Test Instruments

##### Radiated Emission Test Site (966)

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum analyzer	Agilent	N9020A	HKE-048	Feb. 20, 2024	Feb. 19, 2025
Spectrum analyzer	R&S	FSV3044	HKE-126	Feb. 20, 2024	Feb. 19, 2025
Preamplifier	EMCI	EMC051845S	HKE-006	Feb. 20, 2024	Feb. 19, 2025
Preamplifier	Schwarzbeck	BBV 9743	HKE-016	Feb. 20, 2024	Feb. 19, 2025
Preamplifier	A.H. Systems	SAS-574	HKE-182	Feb. 20, 2024	Feb. 19, 2025
6dB Attenuator	Pasternack	6db	HKE-184	Feb. 20, 2024	Feb. 19, 2025
EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	Feb. 20, 2024	Feb. 19, 2025
Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	Feb. 21, 2024	Feb. 20, 2026
Loop Antenna	COM-POWER	AL-130R	HKE-014	Feb. 21, 2024	Feb. 20, 2026
Horn Antenna	Schwarzbeck	9120D	HKE-013	Feb. 21, 2024	Feb. 20, 2026
EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	N/A	N/A
RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).



#### 4.6.3. Test Data

Operation Mode: 802.11a Mode with 5.8G TX CH Low

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	49.68	-2.06	47.62	68.2	-20.58	peak
5700	79.65	-1.96	77.69	105.2	-27.51	peak
5720	80.03	-2.87	77.16	110.8	-33.64	peak
5725	101.16	-2.14	99.02	122.2	-23.18	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	48.22	-2.06	46.16	68.2	-22.04	peak
5700	77.54	-1.96	75.58	105.2	-29.62	peak
5720	80.5	-2.87	77.63	110.8	-33.17	peak
5725	100.01	-2.14	97.87	122.2	-24.33	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



## Operation Mode: TX CH High with 5.8G

## Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	99.75	-1.97	97.78	122.2	-24.42	peak
5855	82.18	-2.13	80.05	110.8	-30.75	peak
5875	75.96	-2.65	73.31	105.2	-31.89	peak
5925	43.27	-2.28	40.99	68.2	-27.21	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

## Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	99.75	-1.97	97.78	122.2	-24.42	peak
5855	82.18	-2.13	80.05	110.8	-30.75	peak
5875	75.96	-2.65	73.31	105.2	-31.89	peak
5925	43.27	-2.28	40.99	68.2	-27.21	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



Operation Mode: 802.11n20 Mode with 5.8G TX CH Low

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	47.63	-2.06	45.57	68.2	-22.63	peak
5700	77.86	-1.96	75.9	105.2	-29.3	peak
5720	80.46	-2.87	77.59	110.8	-33.21	peak
5725	98.78	-2.14	96.64	122.2	-25.56	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	49.58	-2.06	47.52	68.2	-20.68	peak
5700	79.55	-1.96	77.59	105.2	-27.61	peak
5720	81.53	-2.87	78.66	110.8	-32.14	peak
5725	101	-2.14	98.86	122.2	-23.34	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



Operation Mode: TX CH High with 5.8G

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	100.28	-1.97	98.31	122.2	-23.89	peak
5855	81.82	-2.13	79.69	110.8	-31.11	peak
5875	75.07	-2.65	72.42	105.2	-32.78	peak
5925	41.57	-2.28	39.29	68.2	-28.91	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	100.99	-1.97	99.02	122.2	-23.18	peak
5855	81.44	-2.13	79.31	110.8	-31.49	peak
5875	76.18	-2.65	73.53	105.2	-31.67	peak
5925	41.86	-2.28	39.58	68.2	-28.62	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



Operation Mode: 802.11n40 Mode with 5.8G TX CH Low

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	49.31	-2.06	47.25	68.2	-20.95	peak
5700	77.02	-1.96	75.06	105.2	-30.14	peak
5720	82.44	-2.87	79.57	110.8	-31.23	peak
5725	99.64	-2.14	97.5	122.2	-24.7	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5650	49.31	-2.06	47.25	68.2	-20.95	peak
5700	77.02	-1.96	75.06	105.2	-30.14	peak
5720	82.44	-2.87	79.57	110.8	-31.23	peak
5725	99.64	-2.14	97.5	122.2	-24.7	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



Operation Mode: TX CH High with 5.8G

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	98.55	-1.97	96.58	122.2	-25.62	peak
5855	81.1	-2.13	78.97	110.8	-31.83	peak
5875	76.15	-2.65	73.5	105.2	-31.7	peak
5925	42.4	-2.28	40.12	68.2	-28.08	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
5850	98.47	-1.97	96.5	122.2	-25.7	peak
5855	82.88	-2.13	80.75	110.8	-30.05	peak
5875	74.91	-2.65	72.26	105.2	-32.94	peak
5925	42.18	-2.28	39.9	68.2	-28.3	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

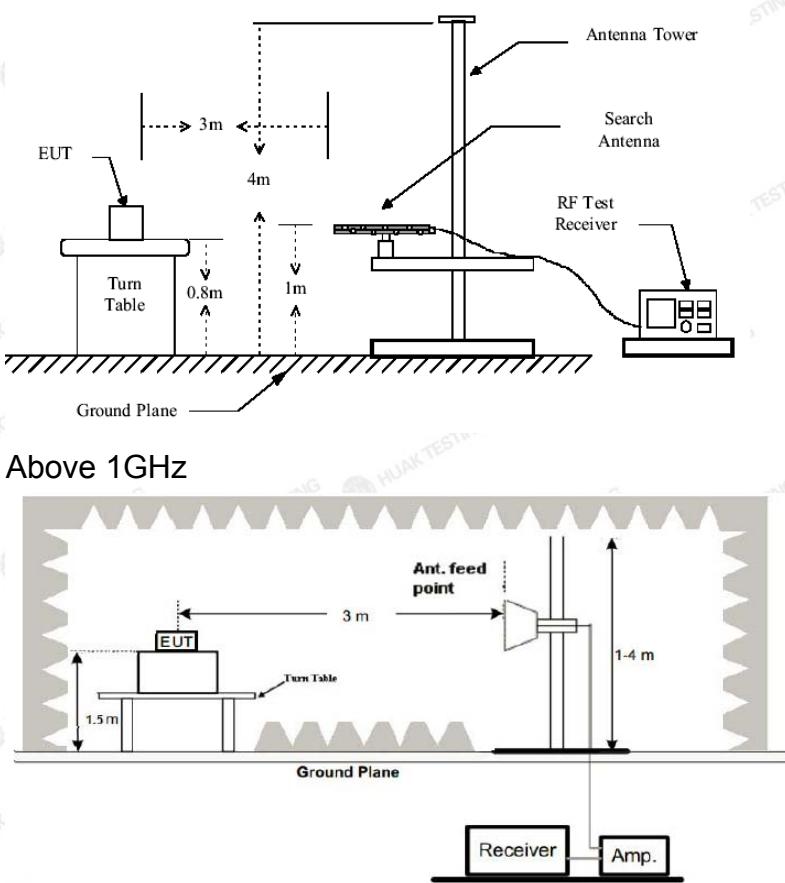


## 4.7. Spurious Emission

### 4.7.1.1. Test Specification

<b>Test Requirement:</b>	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205																																	
<b>Test Method:</b>	KDB 789033 D02 v02r01																																	
<b>Frequency Range:</b>	9kHz to 40GHz																																	
<b>Measurement Distance:</b>	3 m																																	
<b>Antenna Polarization:</b>	Horizontal & Vertical																																	
<b>Operation mode:</b>	Transmitting mode with modulation																																	
<b>Receiver Setup:</b>	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Detector</th> <th>RBW</th> <th>VBW</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>9kHz- 150kHz</td> <td>Quasi-peak</td> <td>200Hz</td> <td>1kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>150kHz- 30MHz</td> <td>Quasi-peak</td> <td>9kHz</td> <td>30kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>30MHz-1GHz</td> <td>Quasi-peak</td> <td>120KHz</td> <td>300KHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td rowspan="2">Above 1GHz</td><td>Peak</td> <td>1MHz</td> <td>3MHz</td> <td>Peak Value</td> </tr> <tr> <td>Peak</td> <td>1MHz</td> <td>10Hz</td> <td>Average Value</td> </tr> </tbody> </table>					Frequency	Detector	RBW	VBW	Remark	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value
Frequency	Detector	RBW	VBW	Remark																														
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value																														
150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value																														
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value																														
Above 1GHz	Peak	1MHz	3MHz	Peak Value																														
	Peak	1MHz	10Hz	Average Value																														
<b>Limit:</b>	<p>(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.</p> <p>(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.</p> <p>(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.</p> <p>(4) For transmitters operating in the 5.725-5.85 GHz band:</p> <p>(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.</p> <p>The limit of frequency below 1GHz and which fall in restricted bands should complies 15.209.</p>																																	
<b>Test setup:</b>	<p>For radiated emissions below 30MHz</p> <p>30MHz to 1GHz</p>																																	

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

**Test Procedure:**

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



	6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
<b>Test results:</b>	PASS



#### 4.7.2. Test Data

**Remark: All the test modes completed for test. Only the worst result of 802. 11a was reported as below:**

##### Below 1GHz

Horizontal



##### Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	35.825826	-14.54	38.40	23.86	40.00	16.14	100	248	Horizontal
2	64.954955	-15.33	41.76	26.43	40.00	13.57	100	14	Horizontal
3	106.70670	-14.49	37.49	23.00	43.50	20.50	100	326	Horizontal
4	184.38438	-15.77	44.59	28.82	43.50	14.68	100	73	Horizontal
5	304.78478	-11.91	41.67	29.76	46.00	16.24	100	360	Horizontal
6	424.21421	-8.89	42.43	33.54	46.00	12.46	100	292	Horizontal

**Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level**



Vertical

**Suspected List**

NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	34.854855	-14.84	47.91	33.07	40.00	6.93	100	200	Vertical
2	63.983984	-14.38	47.04	32.66	40.00	7.34	100	61	Vertical
3	105.73573	-14.49	46.60	32.11	43.50	11.39	100	306	Vertical
4	182.44244	-15.91	47.54	31.63	43.50	11.87	100	178	Vertical
5	422.27227	-9.02	42.39	33.37	46.00	12.63	100	197	Vertical
6	601.90190	-5.23	35.55	30.32	46.00	15.68	100	214	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

**Harmonics and Spurious Emissions****Frequency Range (9 kHz-30MHz)**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Limit@3m (dB $\mu$ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

**Note:** 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

**Above 1GHz****Radiated Emission Test**

LOW CH 149 (802.11 a Mode with 5.8G)/5745

**Horizontal:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	49.94	-4.59	45.35	68.2	-22.85	peak
11096	51.65	4.21	55.86	74	-18.14	peak
11096	30.27	4.21	34.48	54	-19.52	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

**Vertical:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	51.29	-4.59	46.7	68.2	-21.5	peak
11096	49.92	4.21	54.13	74	-19.87	peak
11096	30.23	4.21	34.44	54	-19.56	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



MID CH157 (802.11 a Mode with 5.8G)/5785

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	52.25	-4.59	47.66	68.2	-20.54	peak
10523	51.21	4.21	55.42	68.2	-12.78	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	52.31	-4.59	47.72	68.2	-20.48	peak
10523	52.08	4.21	56.29	68.2	-11.91	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



## HIGH CH 165 (802.11a Mode with 5.8G)/5825

## Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2705	53.33	-4.59	48.74	74	-25.26	
2705	40.59	-4.59	36	54	-18	AVG
11717	50.06	4.84	54.9	74	-19.1	peak
11717	33.98	4.84	38.82	54	-15.18	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

## Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2705	55.08	-4.59	50.49	74	-23.51	
2705	39.19	-4.59	34.6	54	-19.4	AVG
11717	48.73	4.84	53.57	74	-20.43	peak
11717	33.77	4.84	38.61	54	-15.39	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

## Remark:

- (1) Measuring frequencies from 1 GHz to the 40 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) The emissions are attenuated more than 20dB below the permissible limits are not record in the report.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dB $\mu$ V/m(PK Value) < 93.98(AV Limit), at harmonic 53.20 dB $\mu$ V/m(PK Value) < 54 dB $\mu$ V/m(AV Limit), the Average Detected not need to completed.



5.8G 802.11n20 Mode

LOW CH 149

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	51.62	-4.59	47.03	68.2	-21.17	peak
11096	49.28	4.21	53.49	74	-20.51	peak
11096	29.15	4.21	33.36	54	-20.64	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	51.62	-4.59	47.03	68.2	-21.17	peak
11096	49.28	4.21	53.49	74	-20.51	peak
11096	29.15	4.21	33.36	54	-20.64	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



MID CH157

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	51.72	-4.59	47.13	68.2	-21.07	peak
10523	49.09	4.21	53.3	68.2	-14.9	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	52.69	-4.59	48.1	68.2	-20.1	peak
10523	50.07	4.21	54.28	68.2	-13.92	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



## HIGH CH165

## Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2705	54.91	-4.59	50.32	74	-23.68	peak
2705	41.33	-4.59	36.74	54	-17.26	AVG
11717	50.72	4.84	55.56	74	-18.44	peak
11717	33.65	4.84	38.49	54	-15.51	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

## Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2705	55.05	-4.59	50.46	74	-23.54	peak
2705	40.17	-4.59	35.58	54	-18.42	AVG
11717	49.67	4.84	54.51	74	-19.49	peak
11717	34.98	4.84	39.82	54	-14.18	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

## Remark:

- (1) Measuring frequencies from 1 GHz to the 40 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) The emissions are attenuated more than 20dB below the permissible limits are not record in the report.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dB $\mu$ V/m(PK Value) < 93.98(AV Limit), at harmonic 53.20 dB $\mu$ V/m(PK Value) < 54 dB $\mu$ V/m(AV Limit), the Average Detected not need to completed.



5.8G 802.11n40 Mode

LOW CH 151

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	51.6	-4.59	47.01	68.2	-21.19	peak
11096	51.56	4.21	55.77	74	-18.23	peak
11096	29.37	4.21	33.58	54	-20.42	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3368	52.3	-4.59	47.71	68.2	-20.49	peak
11096	50.27	4.21	54.48	74	-19.52	peak
11096	30.7	4.21	34.91	54	-19.09	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit



MID CH159

Horizontal:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	52.3	-4.59	47.71	68.2	-20.49	
10523	50.27	4.21	54.48	68.2	-13.72	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

Vertical:

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
3172	51.47	-4.59	46.88	68.2	-21.32	
10523	49.43	4.21	53.64	68.2	-14.56	peak

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Level - Limit

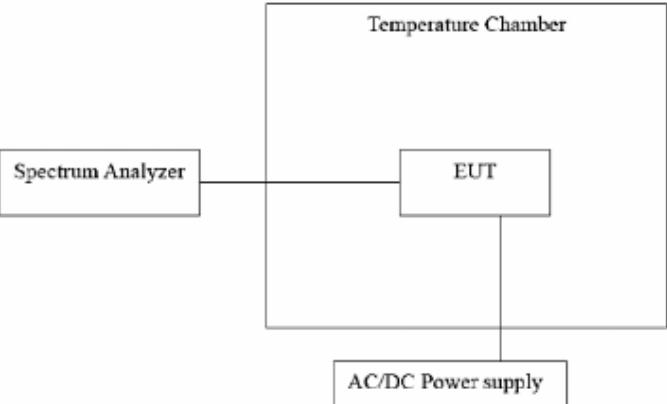
## Remark:

- (1) Measuring frequencies from 1 GHz to the 40 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) The emissions are attenuated more than 20dB below the permissible limits are not record in the report.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dB $\mu$ V/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dB $\mu$ V/m(PK Value) <54 dB $\mu$ V/m(AV Limit), the Average Detected not need to completed.



## 4.8. Frequency Stability Measurement

### 4.8.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 Section 15.407(g)
<b>Test Method:</b>	ANSI C63.10: 2013
<b>Limit:</b>	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.
<b>Test Setup:</b>	
<b>Test Procedure:</b>	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.
<b>Test Result:</b>	PASS
<b>Remark:</b>	N/A

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

**Test Result as follows:**

Mode	Voltage (V)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	108V	5744.965	-35	5825.026	26
	120V	5745.003	3	5825.015	15
	132V	5745.006	6	5825.003	3

Mode	Temperature (°C)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	-30	5744.991	-6	5825.043	43
	-20	5745.043	43	5824.995	-5
	-10	5745.995	-5	5825.011	11
	0	5745.007	7	5824.988	-2
	10	5744.960	-40	5825.035	35
	20	5745.041	40	5824.977	-3
	30	5745.028	28	5824.967	-33
	40	5744.997	-3	5825.006	6
	50	5745.001	1	5824.988	-12



## 4.9. 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

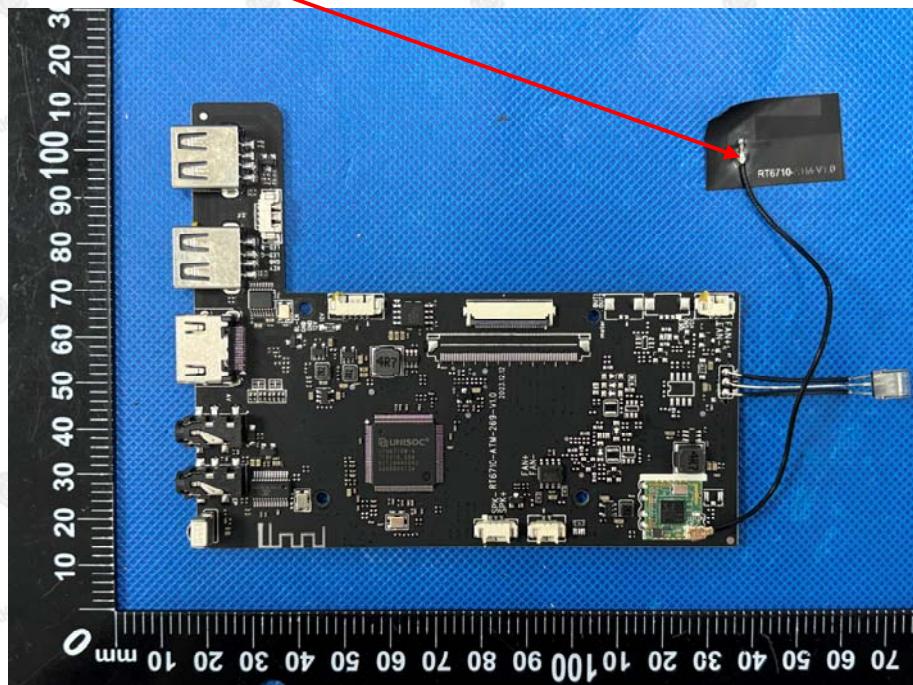
### Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Antenna Connected Construction

The antenna used in this product is a FPC Antenna. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.91dBi.

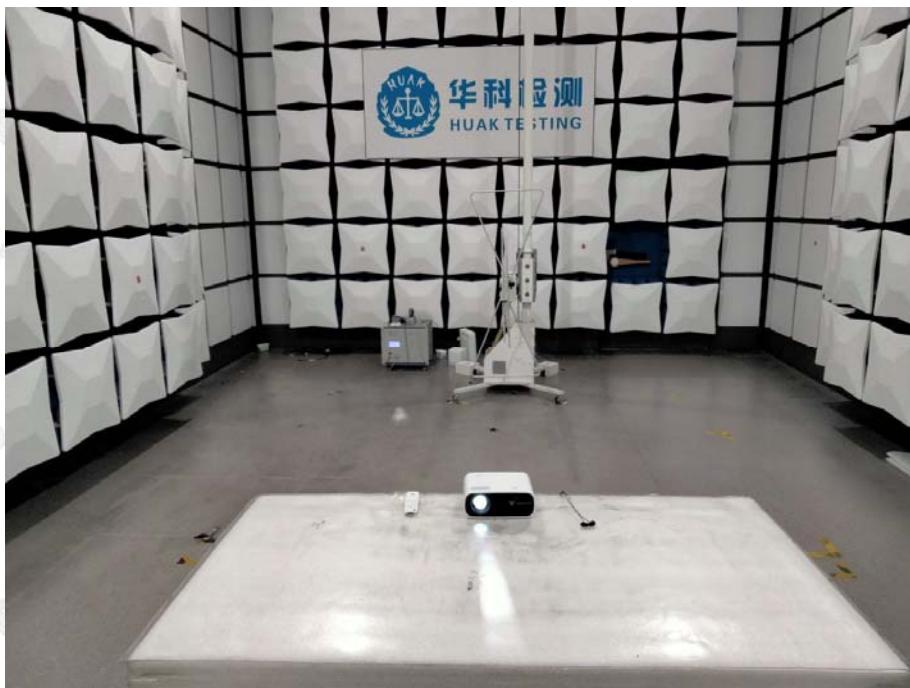
#### WIFI ANTENNA





## 5. Photographs of Test Setup

### Radiated Emission



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

**Conducted Emission**

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.cer-mark.com>

TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : [service@cer-mark.com](mailto:service@cer-mark.com)

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



## 6. Photos of The EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos

-----End of test report-----

