FCC Test Report

Test report
On Behalf of
Shenzhen Dongying Optoelectronics Co., Ltd.
For
Smart projector
Model No.: A2 Pro, A3 Pro, A5 Pro, A6 Pro, A7 Pro, A8 Pro, A9 Pro, A10 Pro, A11 Pro, A12 Pro, A2, A3, A5, A6, A7, A8, A9, A10, A11, A12, Z2 Pro, Z3 Pro, Z5 Pro, Z6 Pro, Z7 Pro, Z8 Pro, Z9 Pro, Z10 Pro, Z11 Pro, Z12 Pro, Delta Y1, Delta Y1 Pro, Delta Y2, Delta Y2 Pro

FCC ID: 2BM4Z-A2PRO

Prepared For :	**Shenzhen Dongying Optoelectronics Co., Ltd.** **3rd Floor, Building 2, No. 42, Di Tang Road, Shajing Street, Shasan Community, Baoan District, Shenzhen, Guangdong Province, 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:	**Dec. 11, 2024 ~ Dec. 24, 2024**
Date of Report:	**Dec. 24, 2024**
Report Number:	**HK2412117666-2E**

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Test Result Certification

Applicant's name ..... :	Shenzhen Dongying Optoelectronics Co., Ltd.
Address..... :	3rd Floor, Building 2, No. 42, Di Tang Road, Shajing Street, Shasan Community, Baoan District, Shenzhen, Guangdong Province, China
Manufacturer's Name..... :	Shenzhen Dongying Optoelectronics Co., Ltd.
Address..... :	3rd Floor, Building 2, No. 42, Di Tang Road, Shajing Street, Shasan Community, Baoan District, Shenzhen, Guangdong Province, China
Product description	
Trade Mark:	N/A
Product name.....:	Smart projector
Model and/or type reference :	A2 Pro, A3 Pro, A5 Pro, A6 Pro, A7 Pro, A8 Pro, A9 Pro, A10 Pro, A11 Pro, A12 Pro, A2, A3, A5, A6, A7, A8, A9, A10, A11, A12, Z2 Pro, Z3 Pro, Z5 Pro, Z6 Pro, Z7 Pro, Z8 Pro, Z9 Pro, Z10 Pro, Z11 Pro, Z12 Pro, Delta Y1, Delta Y1 Pro, Delta Y2, Delta Y2 Pro
Standards..... :	FCC Rules and Regulations Part 15 Subpart E Section 15.407 ANSI C63.10: 2013

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Date of Test ..... :	
Date (s) of performance of tests..... :	Dec. 11, 2024 ~ Dec. 24, 2024
Date of Issue ..... :	Dec. 24, 2024
Test Result..... :	Pass

Testing Engineer : Len Liao

(Len Liao)

Technical Manager : Sliver Wan

(Sliver Wan)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Dec. 24, 2024	Jason Zhou

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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.

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1.3. Measurement Uncertainty

The reported uncertainty of measurement y ± 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	±0.37dB
2	RF power, conducted	±3.35dB
3	Spurious emissions, conducted	±2.20dB
4	All emissions, radiated(<1G)	±3.90dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

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2. EUT Description

2.1. General Description of EUT

Equipment:	Smart projector
Model Name:	A2 Pro
Serial Models:	A3 Pro, A5 Pro, A6 Pro, A7 Pro, A8 Pro, A9 Pro, A10 Pro, A11 Pro, A12 Pro, A2, A3, A5, A6, A7, A8, A9, A10, A11, A12, Z2 Pro, Z3 Pro, Z5 Pro, Z6 Pro, Z7 Pro, Z8 Pro, Z9 Pro, Z10 Pro, Z11 Pro, Z12 Pro, Delta Y1, Delta Y1 Pro, Delta Y2, Delta Y2 Pro
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample mode: A2 Pro.
Trade Mark:	N/A
FCC ID:	2BM4Z-A2PRO
Operation Frequency:	IEEE 802.11a/n/ac (HT20)5.745GHz-5.825GHz IEEE 802.11n/ac (HT40)5.755GHz-5.795GHz
Modulation Technology:	IEEE 802.11a/n/ac
Modulation Type:	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Antenna Type:	FPC Antenna
Antenna Gain:	0.87dBi
Power Source:	AC 100-240V, 50/60Hz
Power Supply:	AC 100-240V, 50/60Hz
Hardware Version:	V2.0
Software Version:	V2.0
Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. Antenna gain Refer to the antenna specifications. 3. The cable loss data is obtained from the supplier. 4. The test results in the report only apply to the tested sample.	

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2.2. Operation Frequency Each of Channel

802.11a/802.11n(HT20) 802.11ac(HT20)		802.11n(HT40) 802.11ac(HT40)	
Channel	Frequency	Channel	Frequency
149	5745	151	5755
153	5765	159	5795
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)/ac(HT20)		
Channel Number	Channel	Frequency (MHz）
149	Low	5745
157	Mid	5785
165	High	5825

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

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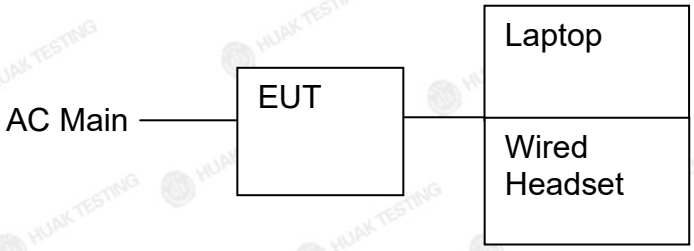
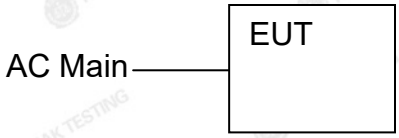
2.4. Description of Test Setup

Operation of EUT during conducted testing and below 1GHz radiation testing:



Operation of EUT during above1GHz radiation 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

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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	Remark
1	Smart projector	N/A	A2 Pro	N/A	EUT
2	Power Line	N/A	N/A	Length:1.5m	Accessory
3	Laptop	N/A	TP00096A	Input: DC 20V, 2.25A/3.25A	Peripheral
4	Wired Headset	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.

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3. Genera Information

3.1. Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations
The sample was placed 0.8m/1.5m for blow/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.	

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:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0
802.11n(HT40)	MCS0
802.11ac(HT20)/ac(HT40)	MCS0
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

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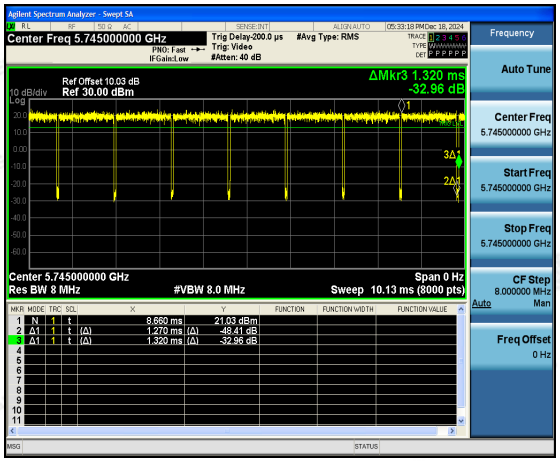
Mode Test Duty Cycle：

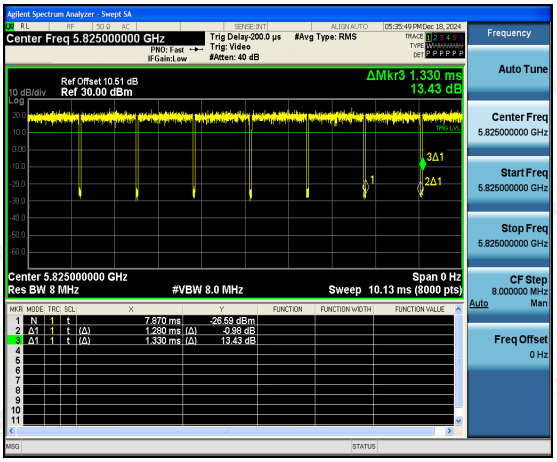
Mode	Duty Cycle	Duty Cycle Factor (dB)
802.11a	0.96	-0.18
802.11n(HT20)	0.96	-0.18
802.11n(HT40)	0.93	-0.32
802.11ac(HT20)	0.96	-0.18
802.11ac(HT40)	0.93	-0.32

Test plots as follows:

802.11a



802.11n(HT20)



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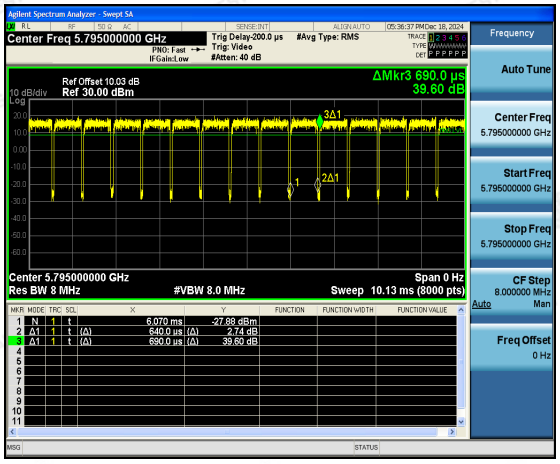
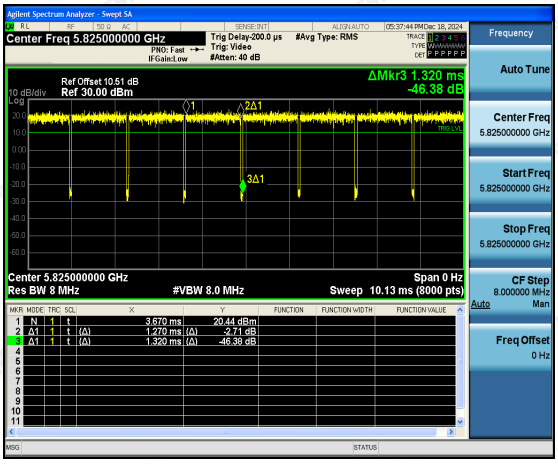
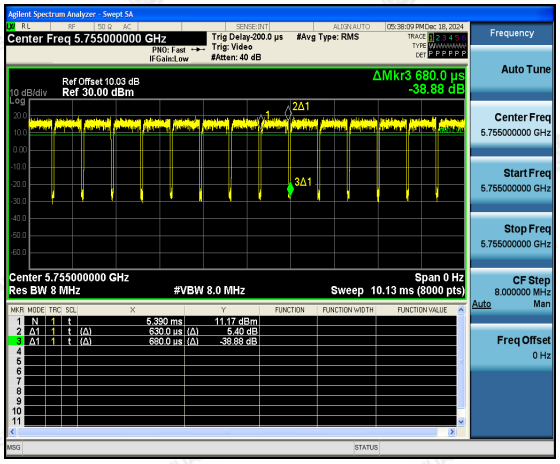
802.11n(HT40)



802.11ac(HT20)



802.11ac(HT40)



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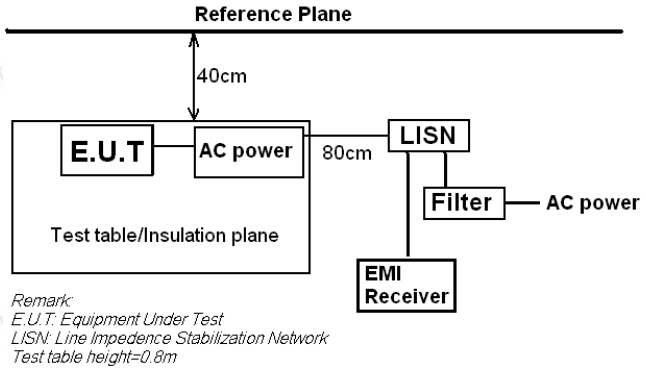
4. Test Results and Measurement Data

4.1. Conducted Emission

4.1.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<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>
</table>
</td></tr>
<tr><td>Test Setup:</td><td>


</td></tr>
<tr><td>Test Mode:</td><td>Tx Mode</td></tr>
<tr><td>Test Procedure:</td><td>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.
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).
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.</td></tr>
<tr><td>Test Result:</td><td>Pass</td></tr>
</table>

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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).*

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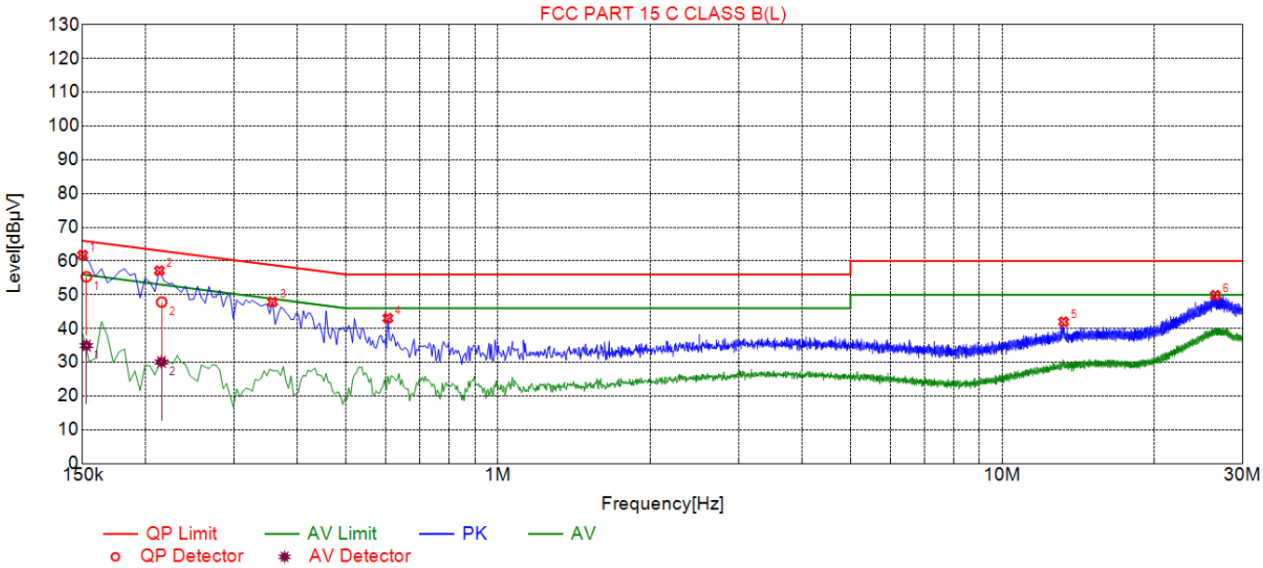
4.1.3. Test data

Test Specification: Line



Suspected List								
NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.1500	61.74	19.83	66.00	4.26	41.91	PK	L
2	0.2130	57.12	19.85	63.23	6.11	37.27	PK	L
3	0.3570	47.88	19.83	58.81	10.93	28.05	PK	L
4	0.6045	43.06	19.86	56.00	12.94	23.20	PK	L
5	13.2315	41.98	19.83	60.00	18.02	22.15	PK	L
6	26.4660	49.83	20.19	60.00	10.17	29.64	PK	L

Final Data List											
NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBµV]	QP Limit [dBµV]	QP Margin [dB]	QP Reading [dBµV]	AV Value [dBµV]	AV Limit [dBµV]	AV Margin [dB]	AV Reading [dBµV]	Type
1	0.1526	19.83	55.32	65.86	10.54	35.49	34.92	55.86	20.94	15.09	L
2	0.2151	19.85	47.82	63.00	15.18	27.97	30.09	53.00	22.91	10.24	L

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

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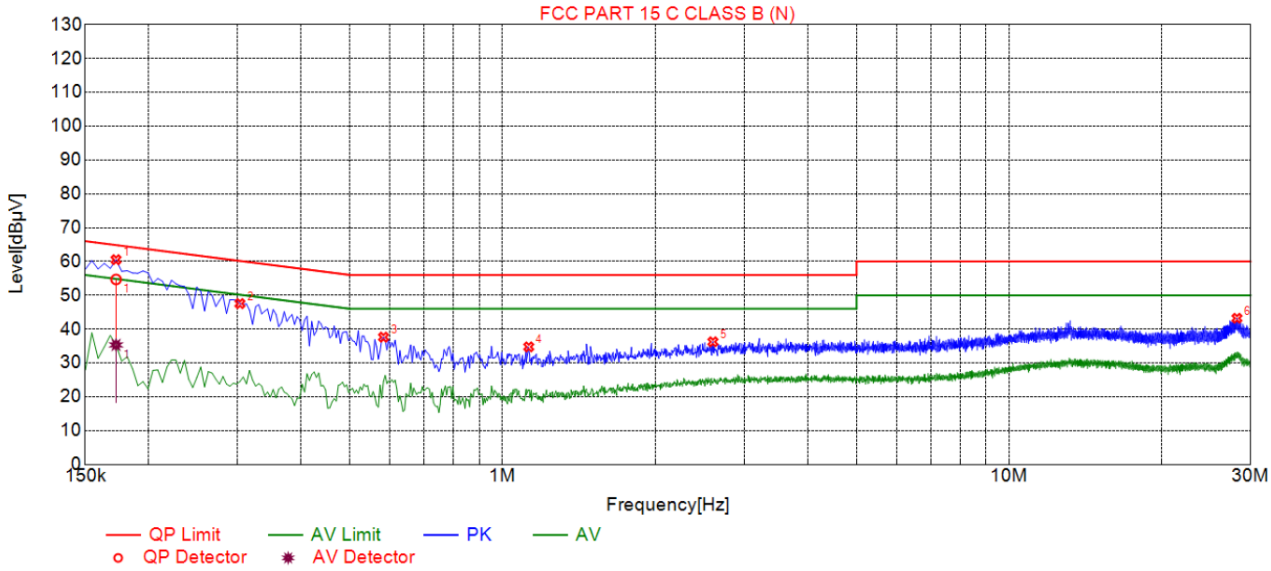
Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1725	60.53	19.73	64.91	4.38	40.80	PK	N
2	0.3030	47.55	19.74	60.23	12.68	27.81	PK	N
3	0.5820	37.63	19.74	56.00	18.37	17.89	PK	N
4	1.1265	34.75	19.76	56.00	21.25	14.99	PK	N
5	2.6025	36.25	19.91	56.00	19.75	16.34	PK	N
6	28.1895	43.22	20.33	60.00	16.78	22.89	PK	N

Final Data List

NO.	Freq. [MHz]	Correction factor[dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	QP Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	AV Reading [dBμV]	Type
1	0.1725	19.73	54.69	64.84	10.15	34.96	35.32	54.84	19.52	15.59	N

Remark: Margin = Limit – Level
Correction factor = Cable lose + LISN insertion loss
Level=Test receiver reading + correction factor

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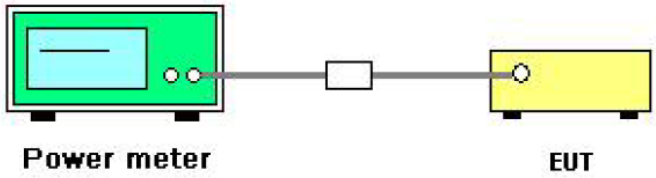
Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

4.2. Maximum Conducted Output Power

4.2.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407(a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02.r01 Section E
Limit:	Frequency Band (MHz): Limit 5725-5850: 1 W
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E, 3, a. 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. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Measure the conducted output power and record the results in the test report.
Test Result:	PASS
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

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4.2.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-025	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 3.5.39	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).*

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Test Data

Configuration Band IV (5725 - 5850 MHz)				
Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
802.11a	CH149	8.50	30	PASS
802.11a	CH157	7.34	30	PASS
802.11a	CH165	7.23	30	PASS
802.11n(HT20)	CH149	6.57	30	PASS
802.11n(HT20)	CH157	7.30	30	PASS
802.11n(HT20)	CH165	7.54	30	PASS
802.11n(HT40)	CH151	6.10	30	PASS
802.11n(HT40)	CH159	6.92	30	PASS
802.11ac(HT20)	CH149	7.16	30	PASS
802.11ac(HT20)	CH157	6.92	30	PASS
802.11ac(HT20)	CH165	7.51	30	PASS
802.11ac(HT40)	CH151	7.08	30	PASS
802.11ac(HT40)	CH159	6.14	30	PASS
Note: 1.The test results including the cable lose.				

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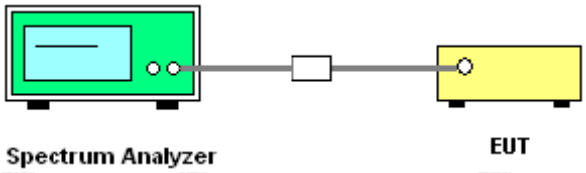
4.3. 6db Emission Bandwidth

4.3.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section C
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C. 2. Set to the maximum power setting and enable the EUT transmit continuously. 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. 4. Measure and record the results in the test report.
Test Result:	PASS

4.3.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-025	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 3.5.39	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).*

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4.3.3. Test data

Band IV (5725 - 5850 MHz)					
Mode	Test Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	CH149	5745	16.36	0.5	PASS
802.11a	CH157	5785	16.36	0.5	PASS
802.11a	CH165	5825	16.48	0.5	PASS
802.11n(HT20)	CH149	5745	17.60	0.5	PASS
802.11n(HT20)	CH157	5785	17.64	0.5	PASS
802.11n(HT20)	CH165	5825	17.64	0.5	PASS
802.11n(HT40)	CH151	5755	36.40	0.5	PASS
802.11n(HT40)	CH159	5795	36.32	0.5	PASS
802.11ac(HT20)	CH149	5745	17.60	0.5	PASS
802.11ac(HT20)	CH157	5785	17.60	0.5	PASS
802.11ac(HT20)	CH165	5825	17.64	0.5	PASS
802.11ac(HT40)	CH151	5755	36.32	0.5	PASS
802.11ac(HT40)	CH159	5795	36.32	0.5	PASS

Test plots as follows:

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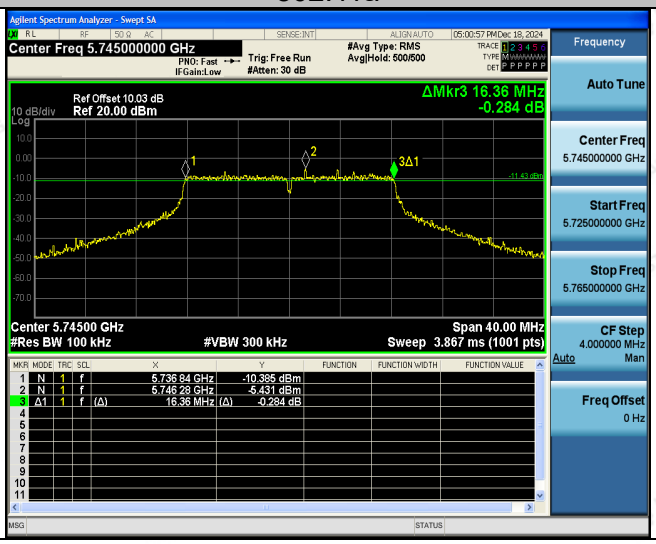
Band IV (5725 – 5850 MHz)

802.11a



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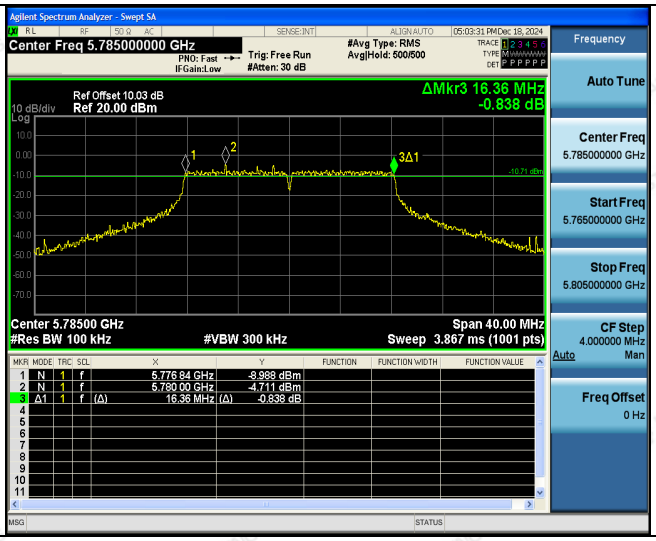

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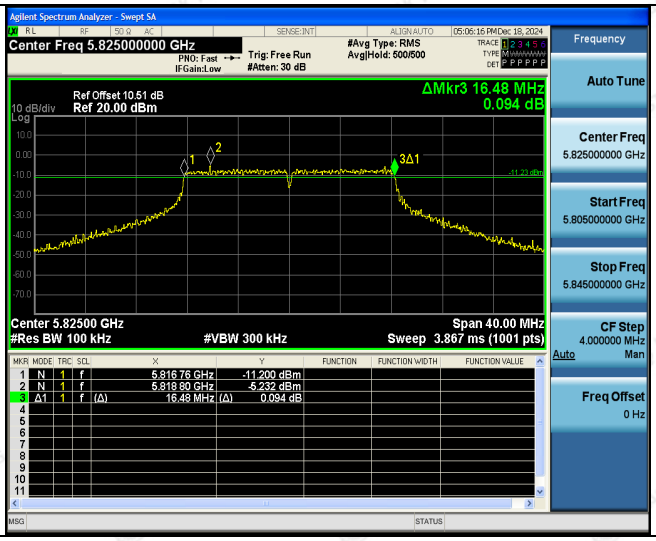

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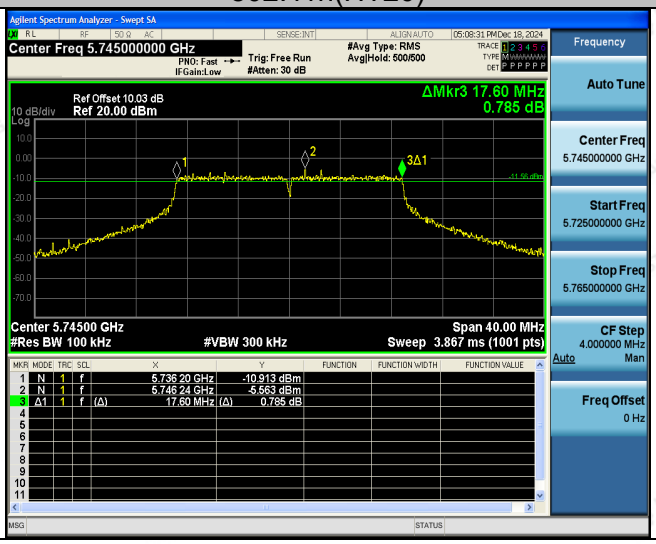
802.11n(HT20)



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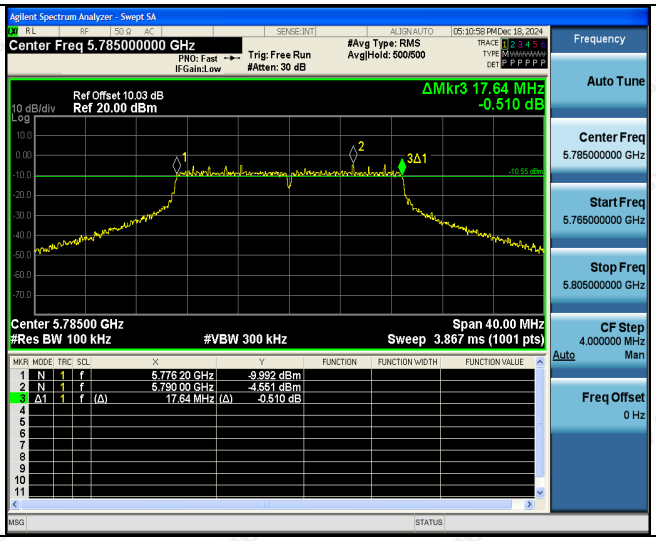

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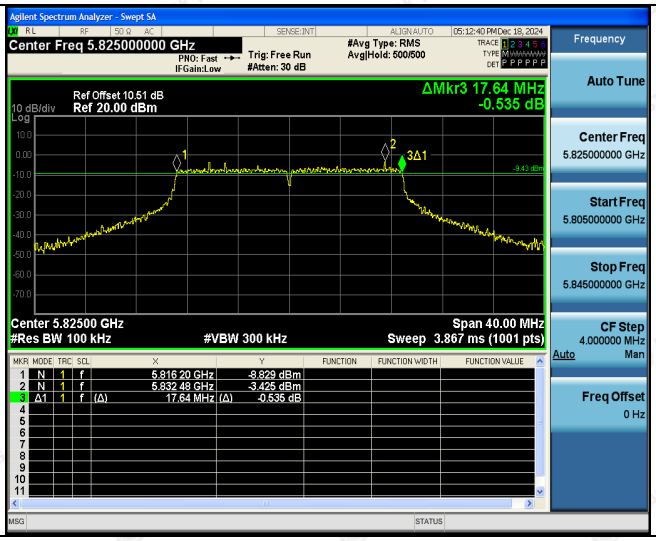

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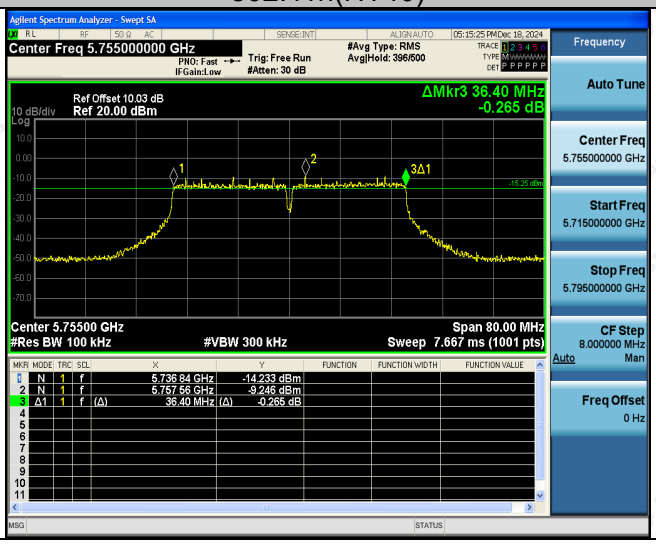
802.11n(HT40)



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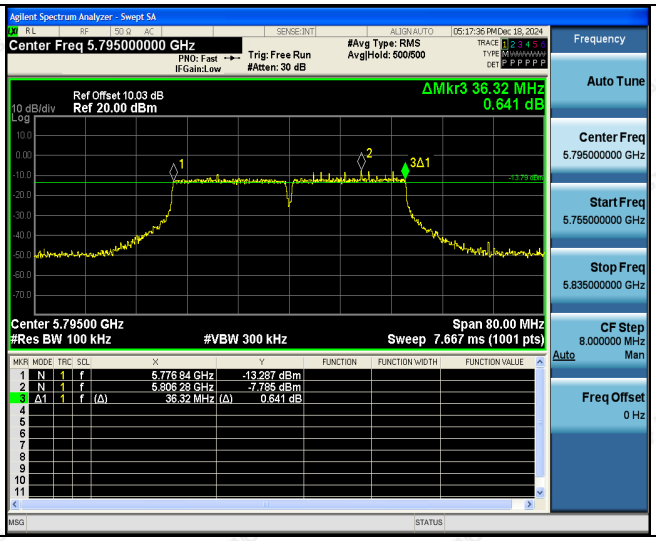

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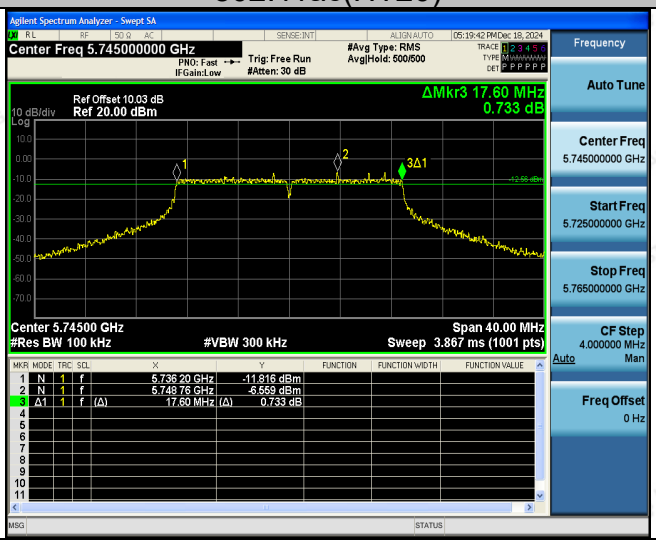
802.11ac(HT20)



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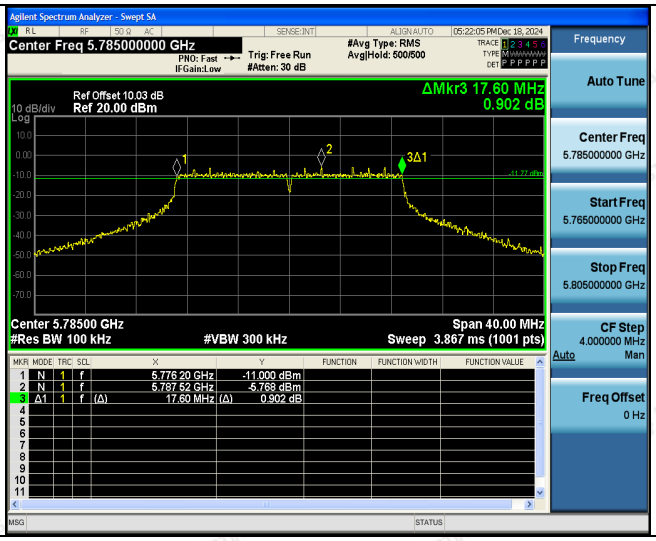

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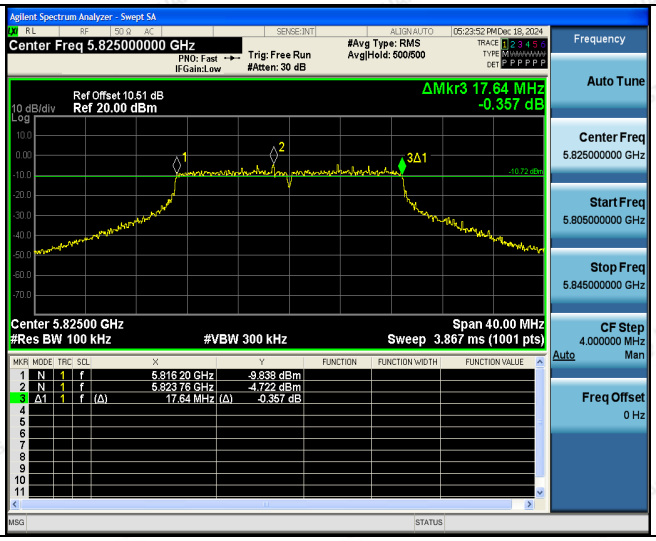

High

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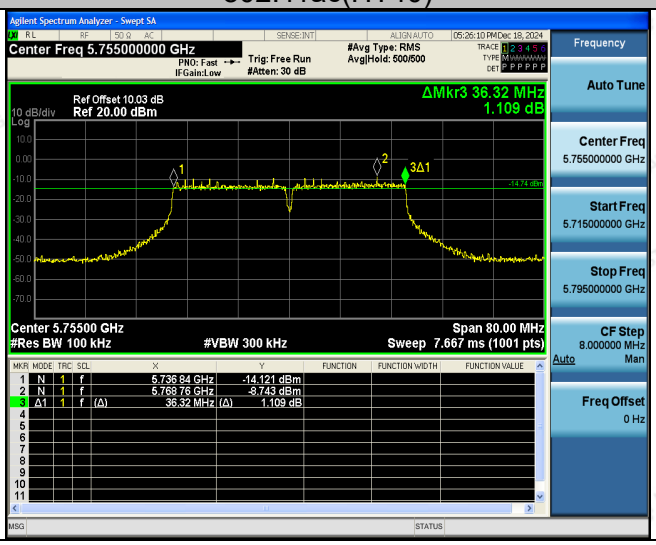
802.11ac(HT40)



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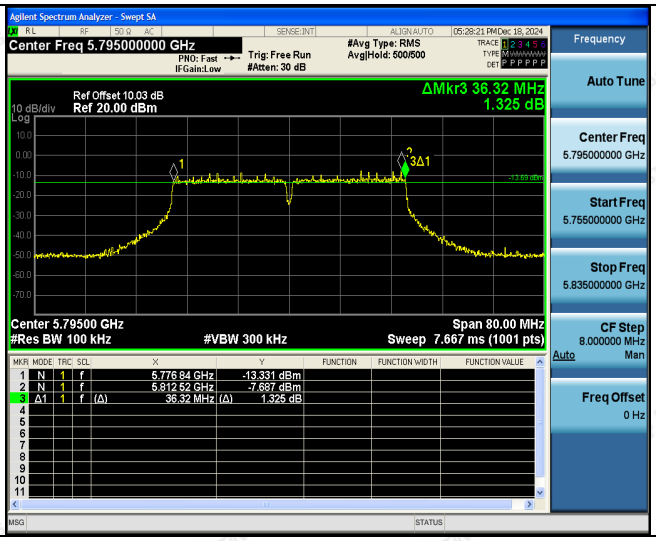

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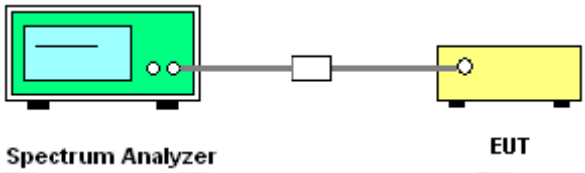
4.4. 26db Bandwidth and 99% Occupied Bandwidth

4.4.1. Test Specification

Test Requirement:	47 CFR Part 15C Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C
Limit:	No restriction limits
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section C. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth RBW = 1% EBW, VBW≥3RBW, In order to make an accurate measurement. 4. Measure and record the results in the test report.
Test Result:	N/A

4.4.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-025	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 3.5.39	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

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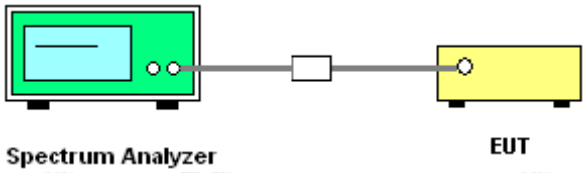
4.5. Power Spectral Density

4.5.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
Limit:	≤30.00dBm/500KHz for Band IV 5725MHz-5850MHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 2. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS. 3. Allow the sweeps to continue until the trace stabilizes. 4. Use the peak marker function to determine the maximum amplitude level. 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.
Test Result:	PASS

4.5.2. Test Instruments

RF Test Room					
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum analyzer	Agilent	N9020A	HKE-025	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 3.5.39	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).*

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4.5.3. Test data

Configuration Band IV (5725 - 5850 MHz)						
Mode	Test Channel	Level [dBm/510kHz]	10log(500/510)	Power Spectral Density	Limit (dBm/500kHz)	Result
802.11a	CH149	4.37	-0.086	4.284	30	PASS
802.11a	CH157	4.76	-0.086	4.674	30	PASS
802.11a	CH165	5.35	-0.086	5.264	30	PASS
802.11n(HT20)	CH149	4.01	-0.086	3.924	30	PASS
802.11n(HT20)	CH157	5.20	-0.086	5.114	30	PASS
802.11n(HT20)	CH165	5.16	-0.086	5.074	30	PASS
802.11n(HT40)	CH151	2.76	-0.086	2.674	30	PASS
802.11n(HT40)	CH159	3.97	-0.086	3.884	30	PASS
802.11ac(HT20)	CH149	3.19	-0.086	3.104	30	PASS
802.11ac(HT20)	CH157	4.71	-0.086	4.624	30	PASS
802.11ac(HT20)	CH165	4.87	-0.086	4.784	30	PASS
802.11ac(HT40)	CH151	2.47	-0.086	2.384	30	PASS
802.11ac(HT40)	CH159	3.76	-0.086	3.674	30	PASS

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

Test plots as follows:

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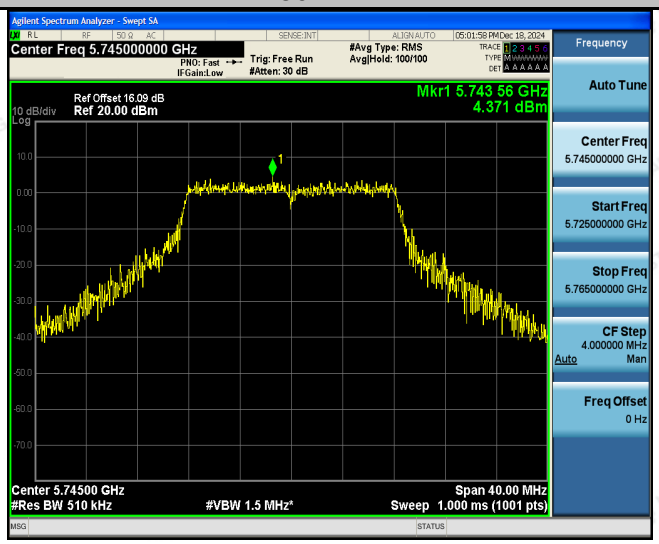
Band IV (5725-5850 MHz)

802.11a



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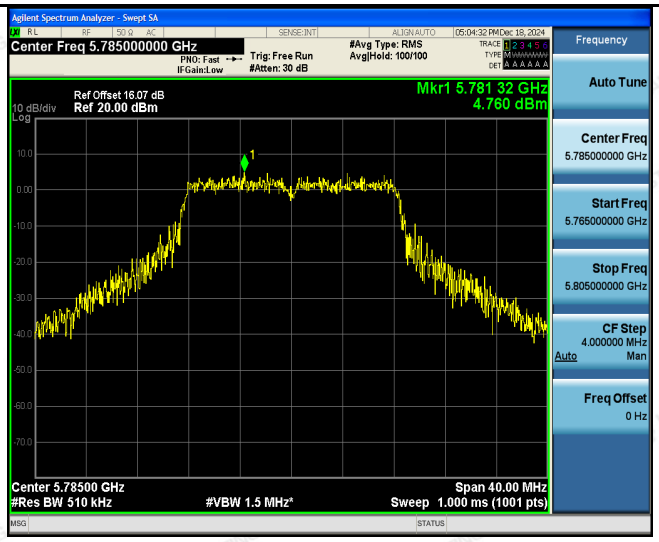

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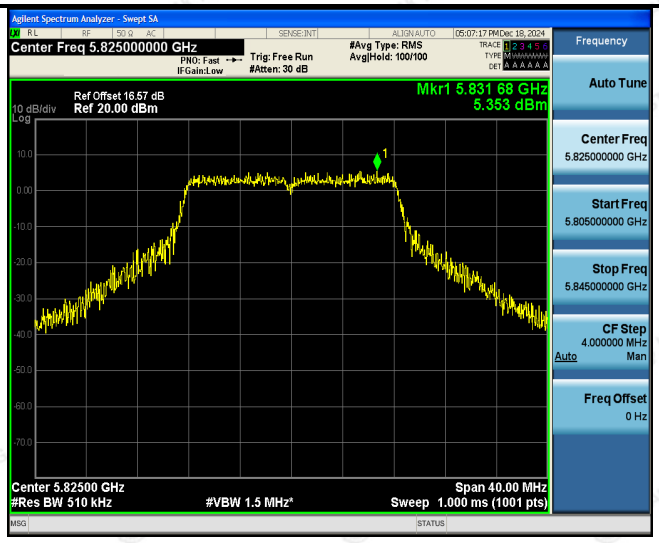

High

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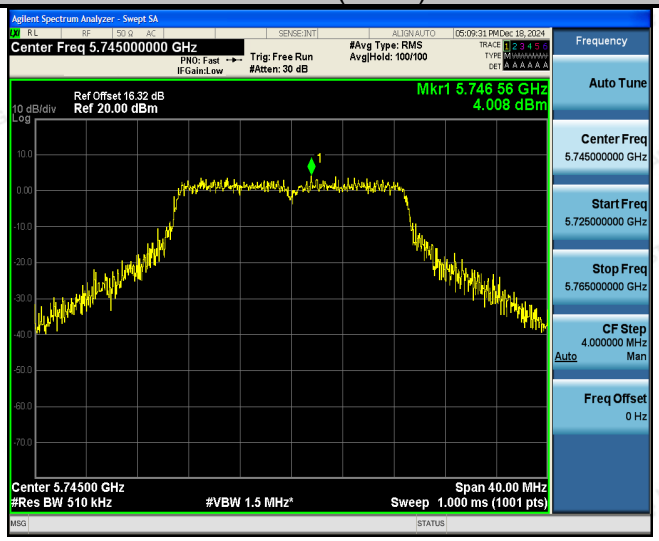
802.11n(HT20)



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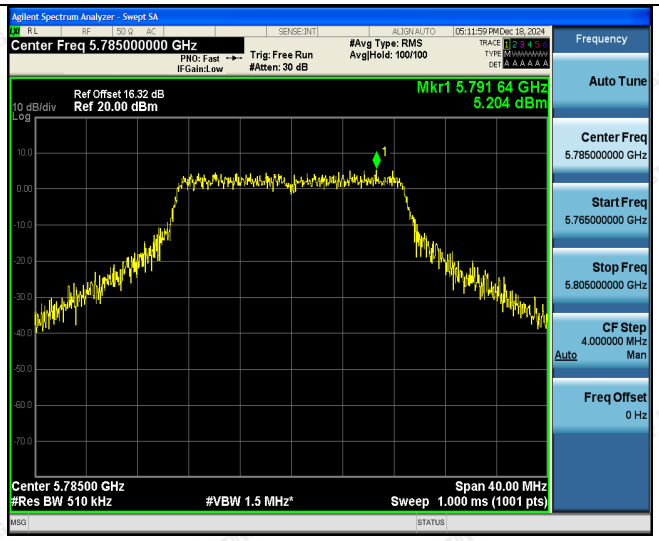

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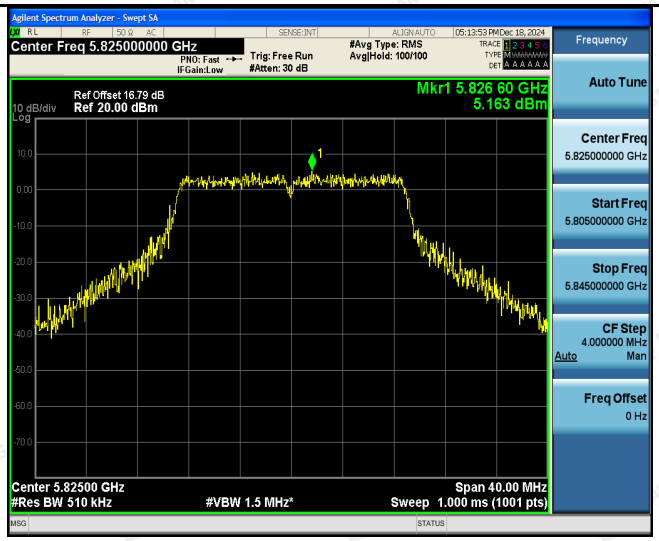

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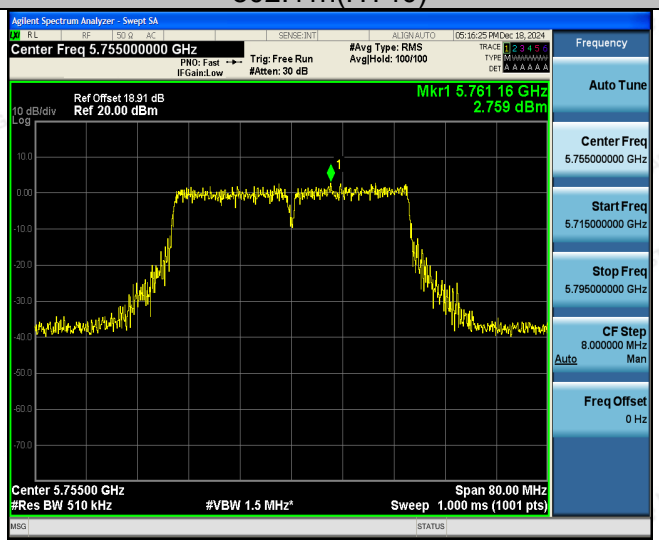
802.11n(HT40)



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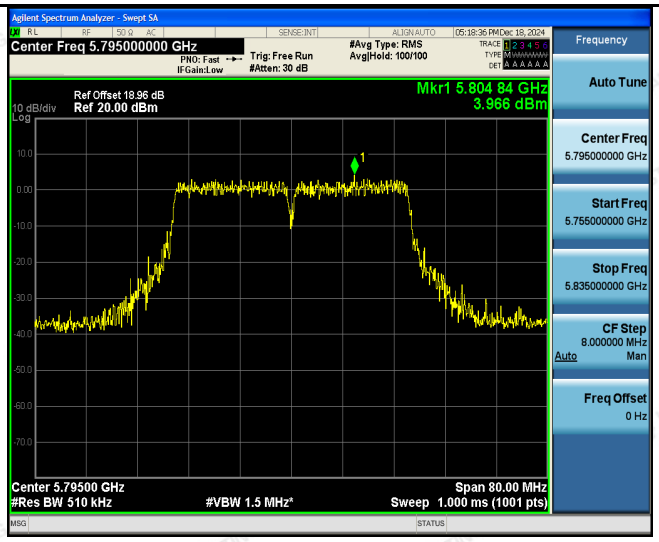
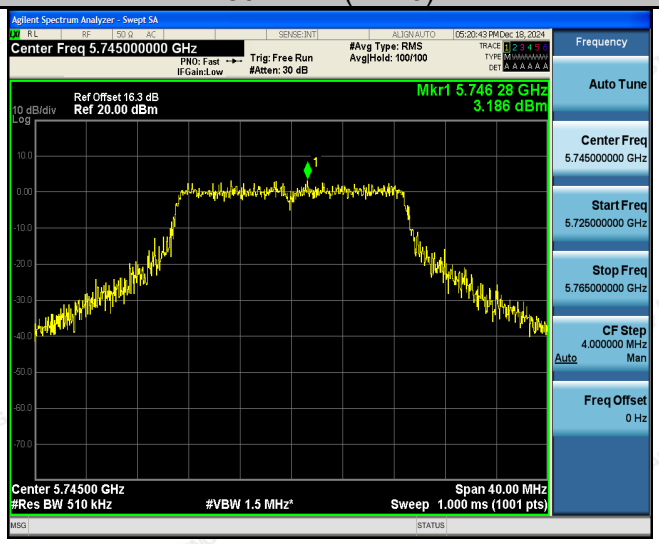


High

802.11ac(HT20)



Low

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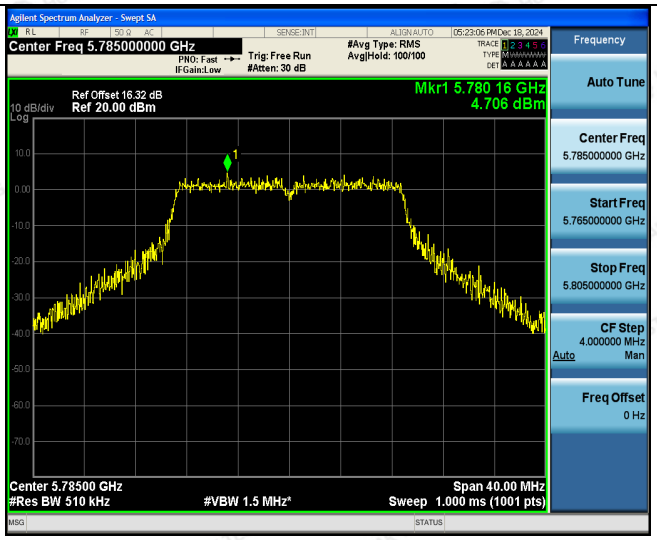
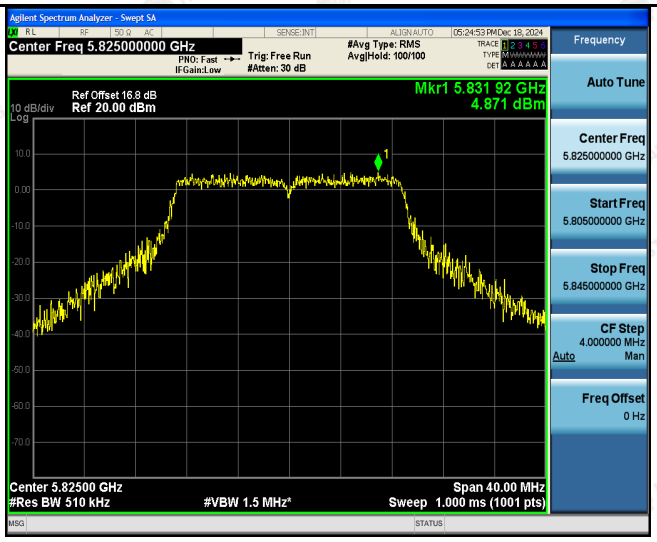
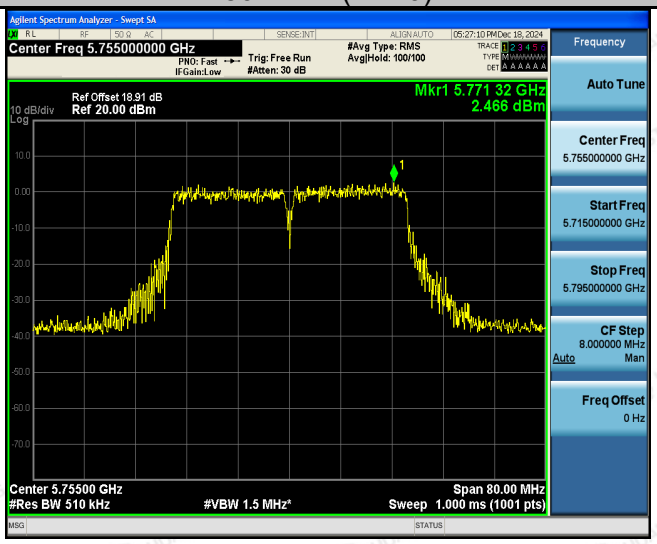


Mid



High

802.11ac(HT40)



Low

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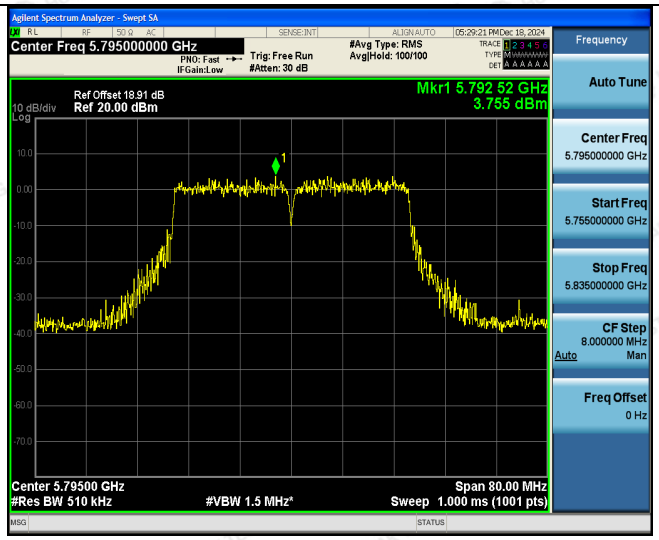

High

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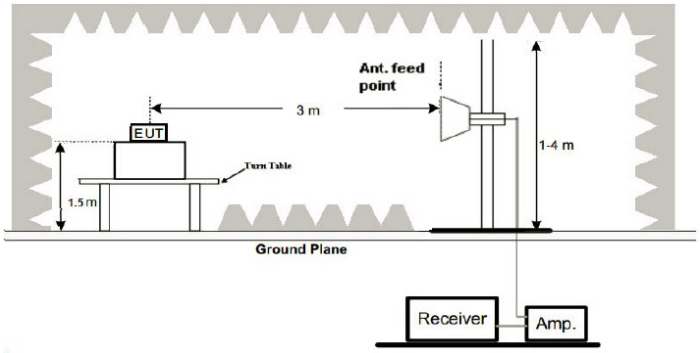
4.6. Band Edge

4.6.1. Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10 2013
Limit:	(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 ba nds should complies 15.209.
Test Setup:	
Test Mode:	Transmitting mode with modulation
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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

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	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.
Test Result:	PASS

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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-025	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).*

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4.6.3. Test Data

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

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	51.73	-2.06	49.67	68.2	-18.53	peak
5700	84.14	-1.96	82.18	105.2	-23.02	peak
5720	88.31	-2.87	85.44	110.8	-25.36	peak
5725	102.85	-2.14	100.71	122.2	-21.49	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	52.22	-2.06	50.16	68.2	-18.04	peak
5700	79.64	-1.96	77.68	105.2	-27.52	peak
5720	87.33	-2.87	84.46	110.8	-26.34	peak
5725	104.18	-2.14	102.04	122.2	-20.16	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	103.98	-1.97	102.01	122.2	-20.19	peak
5855	86.64	-2.13	84.51	110.8	-26.29	peak
5875	85.53	-2.65	82.88	105.2	-22.32	peak
5925	50.25	-2.28	47.97	68.2	-20.23	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	96.54	-1.97	94.57	122.2	-27.63	peak
5855	87.91	-2.13	85.78	110.8	-25.02	peak
5875	80.13	-2.65	77.48	105.2	-27.72	peak
5925	54.21	-2.28	51.93	68.2	-16.27	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: 802.11n/HT20 Mode with 5.8G TX CH Low

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	52.27	-2.06	50.21	68.2	-17.99	peak
5700	82.83	-1.96	80.87	105.2	-24.33	peak
5720	92.74	-2.87	89.87	110.8	-20.93	peak
5725	108.73	-2.14	106.59	122.2	-15.61	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	52.05	-2.06	49.99	68.2	-18.21	peak
5700	90.41	-1.96	88.45	105.2	-16.75	peak
5720	93.53	-2.87	90.66	110.8	-20.14	peak
5725	105.62	-2.14	103.48	122.2	-18.72	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	104.55	-1.97	102.58	122.2	-19.62	peak
5855	89.19	-2.13	87.06	110.8	-23.74	peak
5875	85.45	-2.65	82.8	105.2	-22.4	peak
5925	53.29	-2.28	51.01	68.2	-17.19	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	100.46	-1.97	98.49	122.2	-23.71	peak
5855	88.29	-2.13	86.16	110.8	-24.64	peak
5875	84.87	-2.65	82.22	105.2	-22.98	peak
5925	50.86	-2.28	48.58	68.2	-19.62	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: 802.11n/HT40 Mode with 5.8G TX CH Low

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	52.77	-2.06	50.71	68.2	-17.49	peak
5700	90.11	-1.96	88.15	105.2	-17.05	peak
5720	87.03	-2.87	84.16	110.8	-26.64	peak
5725	107.21	-2.14	105.07	122.2	-17.13	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	52.97	-2.06	50.91	68.2	-17.29	peak
5700	91.21	-1.96	89.25	105.2	-15.95	peak
5720	85.74	-2.87	82.87	110.8	-27.93	peak
5725	104.41	-2.14	102.27	122.2	-19.93	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	100.29	-1.97	98.32	122.2	-23.88	peak
5855	87.15	-2.13	85.02	110.8	-25.78	peak
5875	84.65	-2.65	82	105.2	-23.2	peak
5925	50.77	-2.28	48.49	68.2	-19.71	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	103.06	-1.97	101.09	122.2	-21.11	peak
5855	91.61	-2.13	89.48	110.8	-21.32	peak
5875	84.19	-2.65	81.54	105.2	-23.66	peak
5925	50.93	-2.28	48.65	68.2	-19.55	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: 802.11ac/HT20 Mode with 5.8G TX CH Low

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	53.42	-2.06	51.36	68.2	-16.84	peak
5700	80.47	-1.96	78.51	105.2	-26.69	peak
5720	90.65	-2.87	87.78	110.8	-23.02	peak
5725	103.66	-2.14	101.52	122.2	-20.68	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	50.31	-2.06	48.25	68.2	-19.95	peak
5700	86.14	-1.96	84.18	105.2	-21.02	peak
5720	90.23	-2.87	87.36	110.8	-23.44	peak
5725	103.12	-2.14	100.98	122.2	-21.22	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	102.21	-1.97	100.24	122.2	-21.96	peak
5855	87.71	-2.13	85.58	110.8	-25.22	peak
5875	79.85	-2.65	77.2	105.2	-28	peak
5925	50.08	-2.28	47.8	68.2	-20.4	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	102.91	-1.97	100.94	122.2	-21.26	peak
5855	88.35	-2.13	86.22	110.8	-24.58	peak
5875	79.81	-2.65	77.16	105.2	-28.04	peak
5925	52.29	-2.28	50.01	68.2	-18.19	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: 802.11ac/HT40 Mode with 5.8G TX CH Low

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	53.13	-2.06	51.07	68.2	-17.13	peak
5700	80.15	-1.96	78.19	105.2	-27.01	peak
5720	90.51	-2.87	87.64	110.8	-23.16	peak
5725	103.05	-2.14	100.91	122.2	-21.29	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5650	51.95	-2.06	49.89	68.2	-18.31	peak
5700	84.11	-1.96	82.15	105.2	-23.05	peak
5720	91.42	-2.87	88.55	110.8	-22.25	peak
5725	106.83	-2.14	104.69	122.2	-17.51	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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Operation Mode: TX CH High with 5.8G

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	102.44	-1.97	100.47	122.2	-21.73	peak
5855	87.13	-2.13	85	110.8	-25.8	peak
5875	82.36	-2.65	79.71	105.2	-25.49	peak
5925	50.01	-2.28	47.73	68.2	-20.47	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
5850	110.49	-1.97	108.52	122.2	-13.68	peak
5855	87.84	-2.13	85.71	110.8	-25.09	peak
5875	83.58	-2.65	80.93	105.2	-24.27	peak
5925	54.93	-2.28	52.65	68.2	-15.55	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Remark:
1. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.
2. In restricted bands of operation, the spurious emissions below the permissible value more than 20dB.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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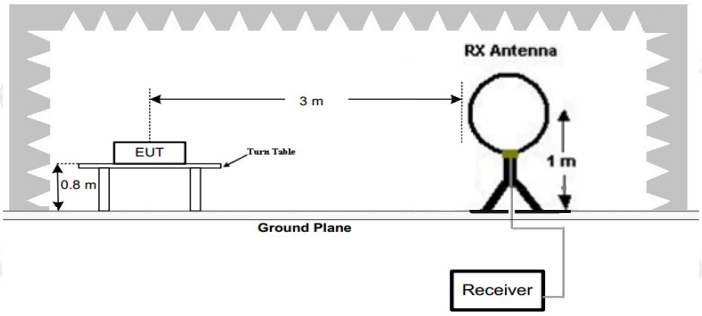
4.7. Spurious Emission

4.7.1.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205</td></tr>
<tr><td>Test Method:</td><td>KDB 789033 D02 v02r01</td></tr>
<tr><td>Frequency Range:</td><td>9kHz to 40GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<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>
</table>
</td></tr>
<tr><td>Limit:</td><td>(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.
(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.
(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.
(4) 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 b ands should complies 15.209.</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 

30MHz to 1GHz</td></tr>
</table>

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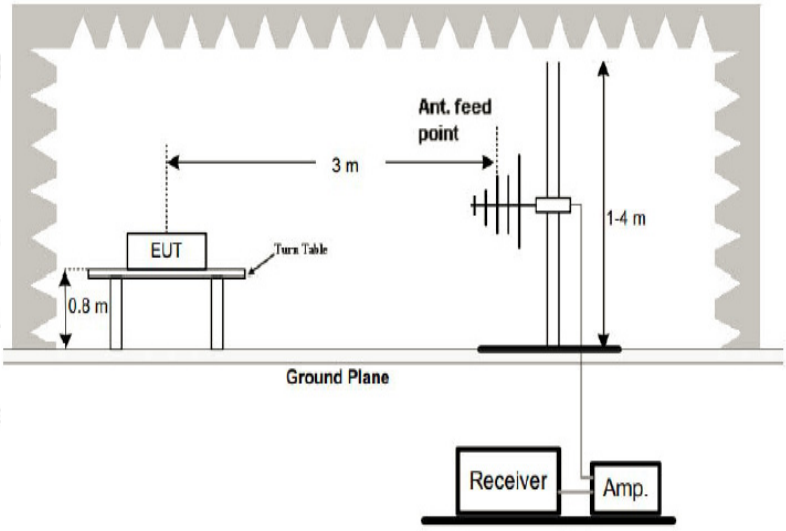
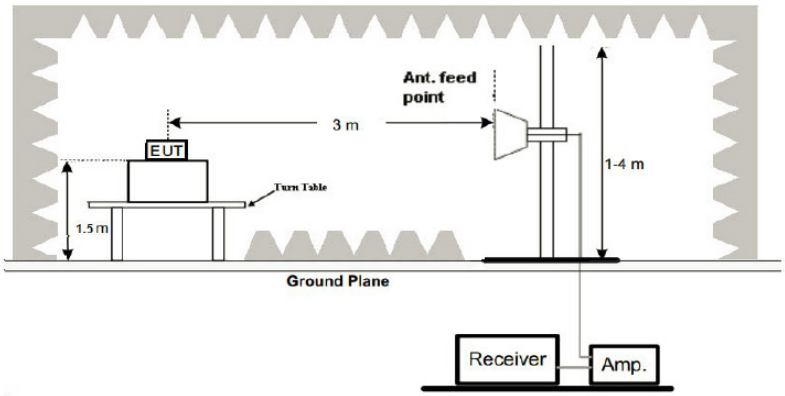
	 Above 1GHz 
Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted 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.

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	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 bere-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test results:	PASS

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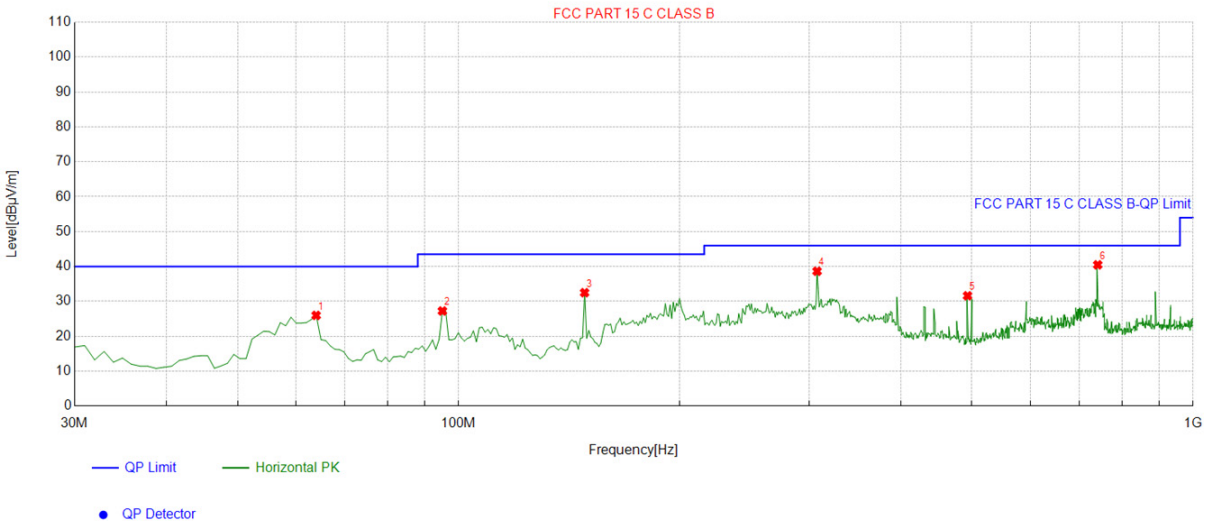
4.7.2. Test Data

Test mode: TX 802.11a 5745MHz

All the test modes completed for test. The worst case of Radiated Emission; the test data of this mode was reported.

Below 1GHz

Horizontal



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	63.983984	-14.38	40.36	25.98	40.00	14.02	100	160	Horizontal
2	95.055055	-15.40	42.65	27.25	43.50	16.25	100	329	Horizontal
3	148.45845	-18.14	50.63	32.49	43.50	11.01	100	322	Horizontal
4	307.69769	-11.88	50.51	38.63	46.00	7.37	100	67	Horizontal
5	493.15315	-7.86	39.46	31.60	46.00	14.40	100	22	Horizontal
6	741.72172	-3.40	43.87	40.47	46.00	5.53	100	357	Horizontal

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

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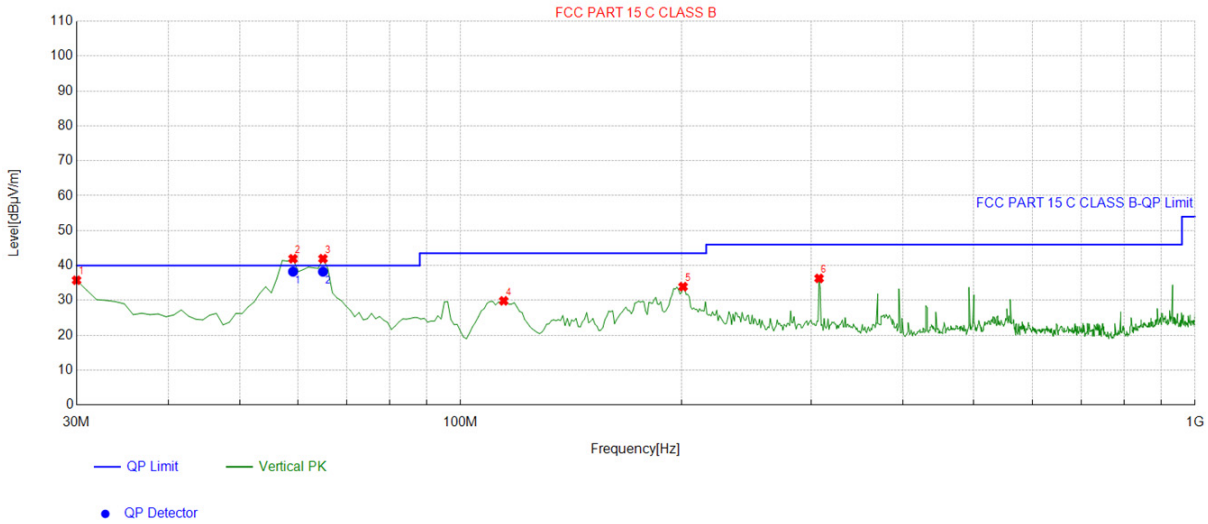
Vertical



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	30	-15.74	51.51	35.77	40.00	4.23	100	110	Vertical
2	59.129129	-13.54	55.47	41.93	40.00	-1.93	100	162	Vertical
3	64.954955	-15.33	57.27	41.94	40.00	-1.94	100	2	Vertical
4	114.47447	-15.28	45.15	29.87	43.50	13.63	100	58	Vertical
5	200.89089	-15.16	49.08	33.92	43.50	9.58	100	145	Vertical
6	307.69769	-11.88	48.18	36.30	46.00	9.70	100	17	Vertical

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBμV/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Polarity
1	59.12912	-13.54	51.78	38.24	40.00	1.76	100	162	Vertical
2	64.95495	-15.33	53.56	38.23	40.00	1.77	100	2	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 (dBμV/m)	Limit@3m (dBμV/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.

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Above 1GHz

RADIATED EMISSION TEST

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

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	54.93	-4.59	50.34	68.2	-17.86	peak
11096	44.34	4.21	48.55	74	-25.45	peak
11096	43.01	4.21	47.22	54	-6.78	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	55.25	-4.59	50.66	68.2	-17.54	peak
11096	45.61	4.21	49.82	74	-24.18	peak
11096	40.32	4.21	44.53	54	-9.47	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3172	52.25	-4.59	47.66	68.2	-20.54	peak
10523	51.16	4.21	55.37	68.2	-12.83	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3172	53.31	-4.59	48.72	68.2	-19.48	peak
10523	51.39	4.21	55.6	68.2	-12.6	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	55.03	-4.59	50.44	74	-23.56	peak
2705	41.38	-4.59	36.79	54	-17.21	AVG
11717	50.69	4.84	55.53	74	-18.47	peak
11717	40.47	4.84	45.31	54	-8.69	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	53.84	-4.59	49.25	74	-24.75	peak
2705	45.38	-4.59	40.79	54	-13.21	AVG
11717	51.82	4.84	56.66	74	-17.34	peak
11717	42.87	4.84	47.71	54	-6.29	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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5.8G 802.11n/HT20 Mode

LOW CH 149

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	57.14	-4.59	52.55	68.2	-15.65	peak
11096	50.82	4.21	55.03	74	-18.97	peak
11096	42.25	4.21	46.46	54	-7.54	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	54.59	-4.59	50	68.2	-18.2	peak
11096	51.61	4.21	55.82	74	-18.18	peak
11096	40.04	4.21	44.25	54	-9.75	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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MID CH157

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3172	57.96	-4.59	53.37	68.2	-14.83	peak
10523	50.06	4.21	54.27	68.2	-13.93	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3172	53.79	-4.59	49.2	68.2	-19	peak
10523	51.88	4.21	56.09	68.2	-12.11	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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HIGH CH165

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	55.68	-4.59	51.09	74	-22.91	peak
2705	42.58	-4.59	37.99	54	-16.01	AVG
11717	50.02	4.84	54.86	74	-19.14	peak
11717	40.97	4.84	45.81	54	-8.19	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	56.35	-4.59	51.76	74	-22.24	peak
2705	42.91	-4.59	38.32	54	-15.68	AVG
11717	52.66	4.84	57.5	74	-16.5	peak
11717	41.22	4.84	46.06	54	-7.94	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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5.8G 802.11n/HT40 Mode

LOW CH 151

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	59.22	-4.59	54.63	68.2	-13.57	peak
11096	53.71	4.21	57.92	74	-16.08	peak
11096	32.94	4.21	37.15	54	-16.85	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	60.42	-4.59	55.83	68.2	-12.37	peak
11096	50.21	4.21	54.42	74	-19.58	peak
11096	34.41	4.21	38.62	54	-15.38	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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MID CH159

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3172	60.91	-4.59	56.32	68.2	-11.88	peak
10523	53.64	4.21	57.85	68.2	-10.35	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3172	55.15	-4.59	50.56	68.2	-17.64	peak
10523	51.32	4.21	55.53	68.2	-12.67	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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5.8G 802.11ac/HT20 Mode

LOW CH 149

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3368	54.59	-4.59	50	68.2	-18.2	peak
11096	48.76	4.21	52.97	74	-21.03	peak
11096	41.92	4.21	46.13	54	-7.87	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
3368	54.59	-4.59	50	68.2	-18.2	peak
11096	52.24	4.21	56.45	74	-17.55	peak
11096	41.16	4.21	45.37	54	-8.63	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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MID CH157

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3172	54.97	-4.59	50.38	68.2	-17.82	peak
10523	45.92	4.21	50.13	68.2	-18.07	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3172	54.06	-4.59	49.47	68.2	-18.73	peak
10523	51.99	4.21	56.2	68.2	-12	peak
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

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HIGH CH165

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	54.13	-4.59	49.54	74	-24.46	peak
2705	44.22	-4.59	39.63	54	-14.37	AVG
11717	52.28	4.84	57.12	74	-16.88	peak
11717	41.04	4.84	45.88	54	-8.12	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2705	55.19	-4.59	50.6	74	-23.4	peak
2705	43.84	-4.59	39.25	54	-14.75	AVG
11717	52.08	4.84	56.92	74	-17.08	peak
11717	40.88	4.84	45.72	54	-8.28	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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5.8G 802.11ac/HT40 Mode

LOW CH 151

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	54.62	-4.59	50.03	68.2	-18.17	peak
11096	51.17	4.21	55.38	74	-18.62	peak
11096	34.38	4.21	38.59	54	-15.41	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
3368	56.21	-4.59	51.62	68.2	-16.58	peak
11096	51.57	4.21	55.78	74	-18.22	peak
11096	39.56	4.21	43.77	54	-10.23	AVG
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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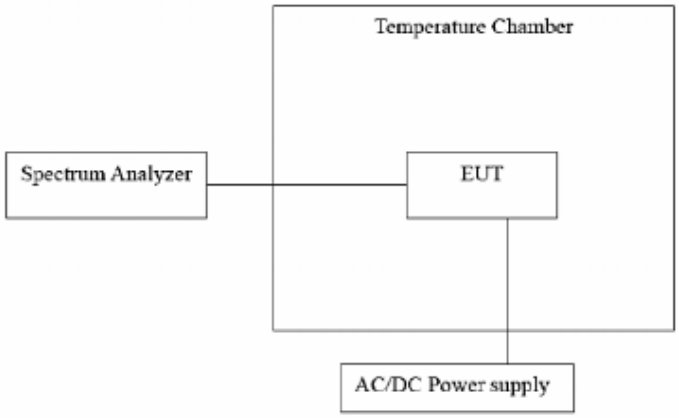
4.8. Frequency Stability Measurement

4.8.1. Test Specification

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

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Test Result as follows:

Mode	Voltage (V)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	AC 102V	5744.988	-12	5825.012	12
	AC 120V	5745.009	9	5824.977	-23
	AC 138V	5744.993	-7	5824.985	-15

Mode	Temperature (℃)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	-30	5744.966	-34	5825.013	13
	-20	5745.007	7	5825.017	17
	-10	5744.981	-19	5824.992	-8
	0	5744.979	-21	5824.974	-26
	10	5744.963	-37	5825.022	22
	20	5745.015	15	5824.986	-14
	30	5744.989	-11	5824.971	-29
	40	5744.987	-13	5824.968	-32
	50	5744.975	-25	5825.011	11

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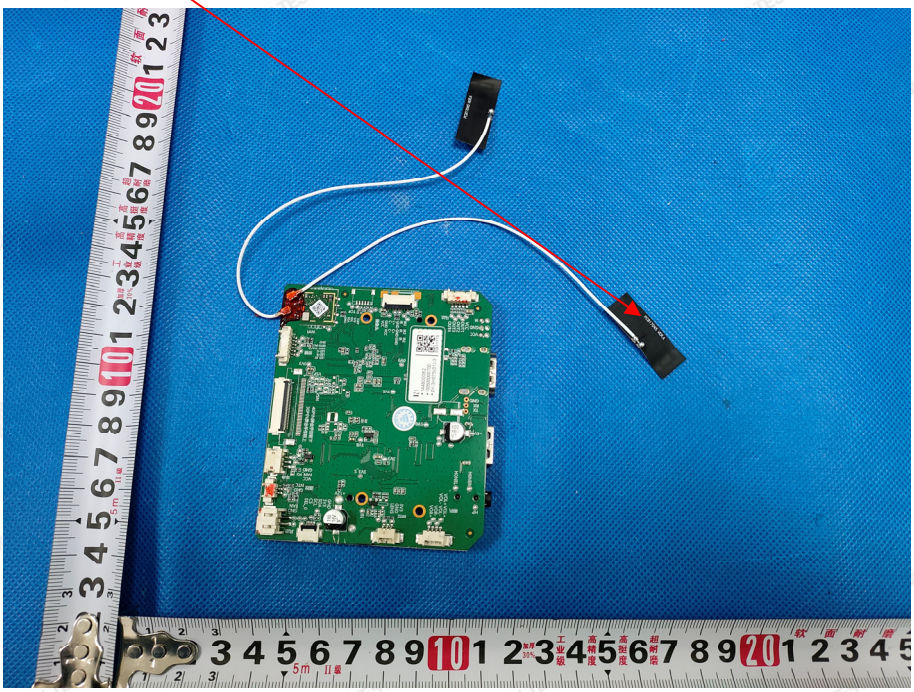
4.9. Antenna Requirement

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, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 0.87dBi.

Antenna



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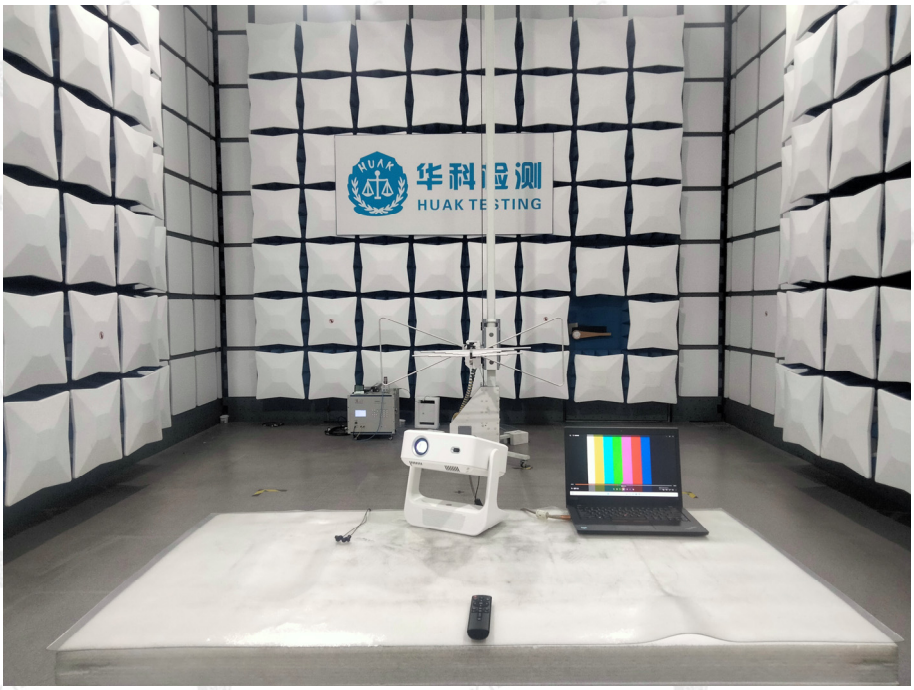
5. Test Setup Photos of the EUT

Radiated Emission



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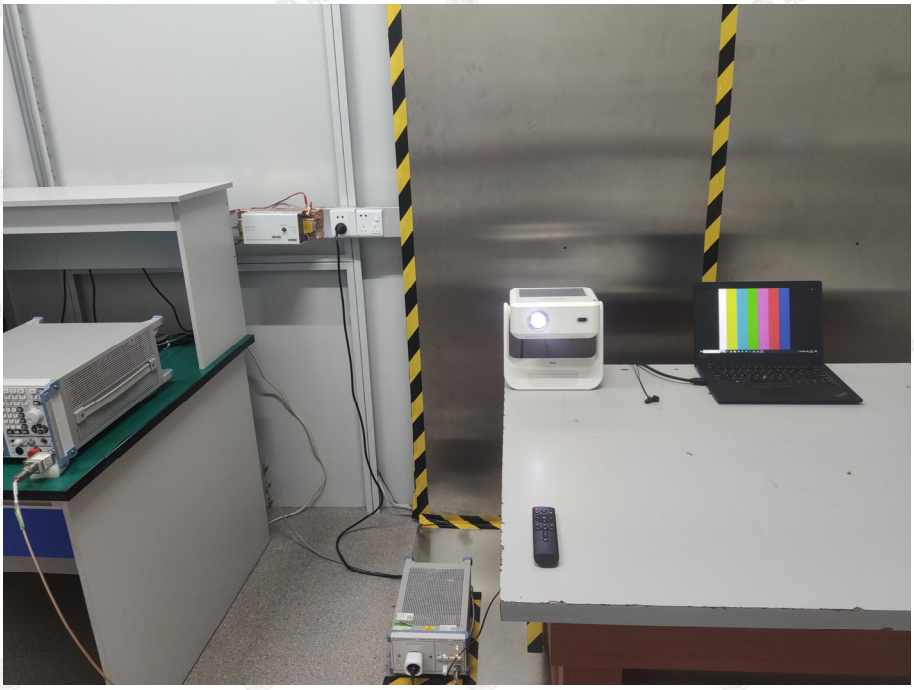
Conducted Emission



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6. Photos of the EUT

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

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

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