FCC Test Report

Test report
On Behalf of
Shenzhen suofeixiang technology Co., Ltd
For
Wireless Extender
Model No.: HDWE03, HDWE01, HDWE02, HDWE04, HDWE05, HDWE06, HDWE07, HDWE08, HDWE09, HDWE10, HDWE11, HDWE12, HDWE13, HDWE14, HDWE15, HDWE16, HDWE17, HDWE18, HDWE19, HDWE20, HDWE21, HDWE22, HDWE23, HDWE24, HDWE25, HDWE26, HDWE27, HDWE28, HDWE29, HDWE30, HDES09, HDES11, HDES11-1080, HDWE200, HDWE150

FCC ID: 2BKV2-HDWE03

Prepared For :	**Shenzhen suofeixiang technology Co., Ltd** **Room 710, 7th Floor, Building F, Huafeng International Robot Industrial Park, Hangcheng Avenue, Xixiang Street, Baoan District, Shenzhen, 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:	**Aug. 16, 2024 ~ Sept. 04, 2024**
Date of Report:	**Sept. 04, 2024**
Report Number:	**HK2408164701-2E**

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Test Result Certification

Applicant's name .....:	Shenzhen suofeixiang technology Co., Ltd
Address .....:	Room 710, 7th Floor, Building F, Huafeng International Robot Industrial Park, Hangcheng Avenue, Xixiang Street, Baoan District, Shenzhen, China
Manufacturer's Name .....:	Dongguan zhixing video electronic technology co., ltd
Address .....:	Room 503, Building 13, No.1 Jingdong Road, Fenggang Town, Dongguan, China
Product description	
Trade Mark:	N/A
Product name ..... :	Wireless Extender
Model and/or type reference .:	HDWE03, HDWE01, HDWE02, HDWE04, HDWE05, HDWE06, HDWE07, HDWE08, HDWE09, HDWE10, HDWE11, HDWE12, HDWE13, HDWE14, HDWE15, HDWE16, HDWE17, HDWE18, HDWE19, HDWE20, HDWE21, HDWE22, HDWE23, HDWE24, HDWE25, HDWE26, HDWE27, HDWE28, HDWE29, HDWE30, HDES09, HDES11, HDES11-1080, HDWE200, HDWE150
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 .....:	**Aug. 16, 2024 ~ Sept. 04, 2024**
Date of Issue.....:	**Sept. 04, 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	Sept. 04, 2024	Jason Zhou

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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.

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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	Wireless Extender
Model Name	HDWE03
Serial Model	HDWE01, HDWE02, HDWE04, HDWE05, HDWE06, HDWE07, HDWE08, HDWE09, HDWE10, HDWE11, HDWE12, HDWE13, HDWE14, HDWE15, HDWE16, HDWE17, HDWE18, HDWE19, HDWE20, HDWE21, HDWE22, HDWE23, HDWE24, HDWE25, HDWE26, HDWE27, HDWE28, HDWE29, HDWE30, HDES09, HDES11, HDES11-1080, HDWE200, HDWE150
Trade Mark	N/A
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: HDWE03.
FCC ID	2BKV2-HDWE03
Operation Frequency:	IEEE 802.11a/n/ac (HT20)5.745GHz-5.825GHz IEEE 802.11n/ac (HT40)5.755GHz-5.795GHz IEEE 802.11ac (HT80) 5.775GHz
Modulation Technology:	IEEE 802.11a/n/ac
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Antenna Type	External Antenna
Antenna Gain	Antenna 1:4.71dBi Antenna 2:4.71dBi MIMO: 7.72dBi
Power Source	DC 5V From Type-C
Power Supply:	DC 5V From Type-C
Hardware Version	V1.4
Software Version	V1.4
Note: 1.The EUT incorporates a MIMO function. Physically, it provides two completed transmitters and receivers(2T2R), two transmit signals are completely correlated, then, Direction gain =GANT + Array Gain(Array Gain=10 log(2) dB for power spectral density; Array Gain=0 for power measurement) 2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 3. Antenna gain Refer to the antenna specifications. 4. The cable loss data is obtained from the supplier. 5. 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)		802.11ac(HT80)	
Channel	Frequency	Channel	Frequency	Channel	Frequency
149	5745	151	5755	155	5775
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

For 802.11ac(HT80)		
Channel Number	Channel	Frequency (MHz)
155	/	5775

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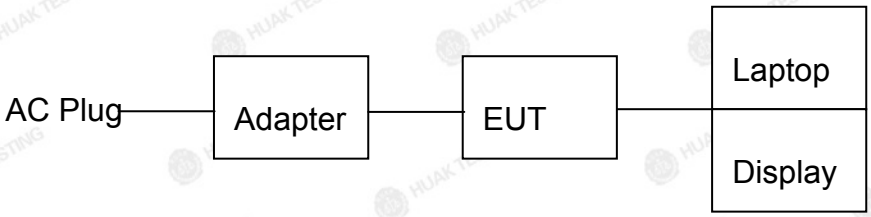
2.4. Description of Test Setup

Operation of EUT during 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	Wireless Extender	N/A	HDWE03	N/A	EUT
2	HDMI Cable	N/A	N/A	Length:0.16m	Accessory
3	Adapter	N/A	1201	Input: 5V, 2A	Accessory
4	Laptop	N/A	TP00096A	Input: DC 20V, 2.25A/3.25A	Peripheral
5	HDMI Cable	N/A	N/A	Length:1.04m	Peripheral
6	Display	N/A	279E1	Input: 20V, 3.25A	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, 26db Bandwidth and 99% Occupied 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)/ac(HT80)	MCS0
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation

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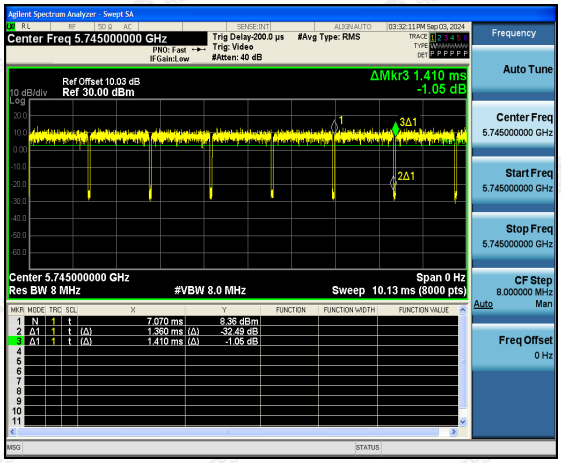
Mode Test Duty Cycle： ANT.1

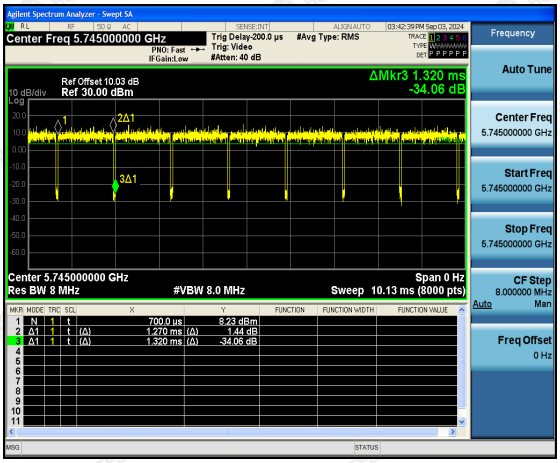
Mode	Duty Cycle	Duty Cycle Factor (dB)
802.11a	0.96	-0.18
802.11n(HT20)	0.96	-0.18
802.11n(HT40)	0.93	-0.32
802.11ac(HT20)	0.96	-0.18
802.11ac(HT40)	0.91	-0.41
802.11ac(HT80)	0.84	-0.76

Test plots as follows:

802.11a



802.11n(HT20)



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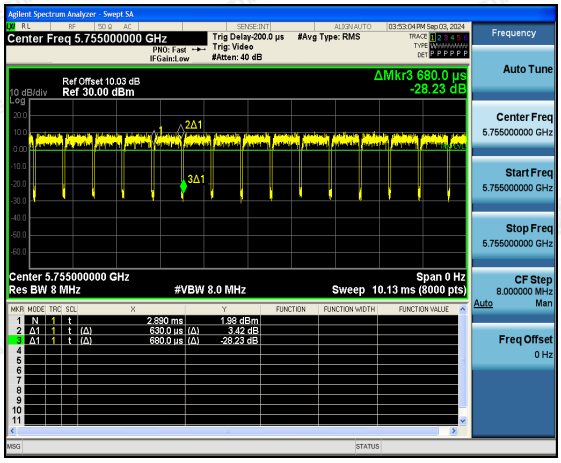
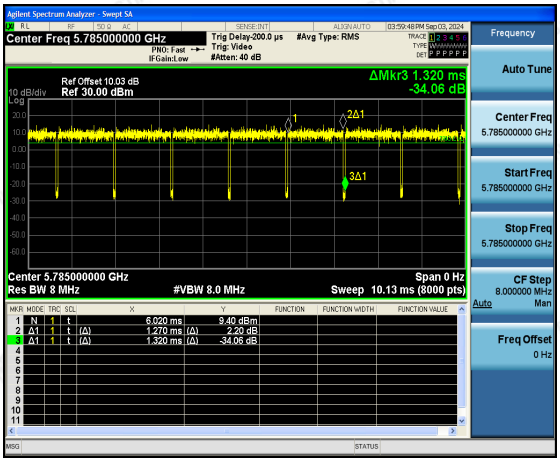
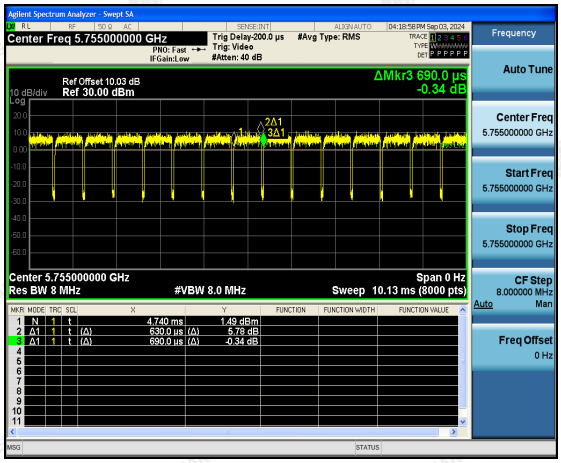
802.11n(HT40)



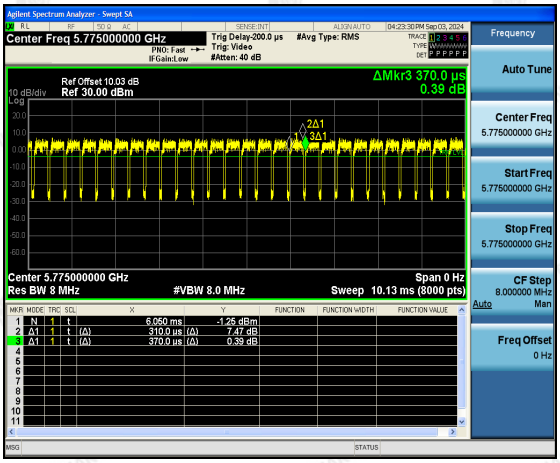
802.11ac(HT20)



802.11ac(HT40)



802.11ac(HT80)



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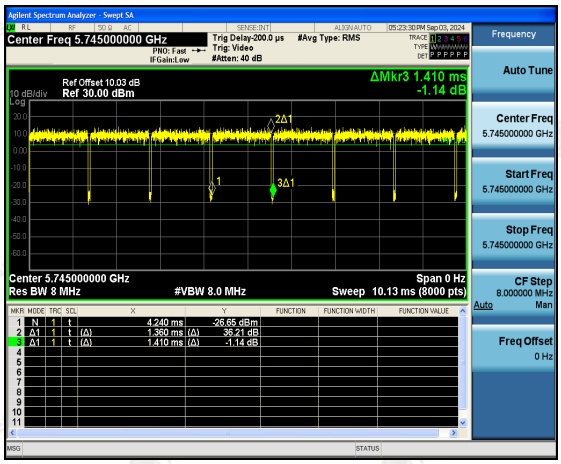
Mode Test Duty Cycle： ANT.2

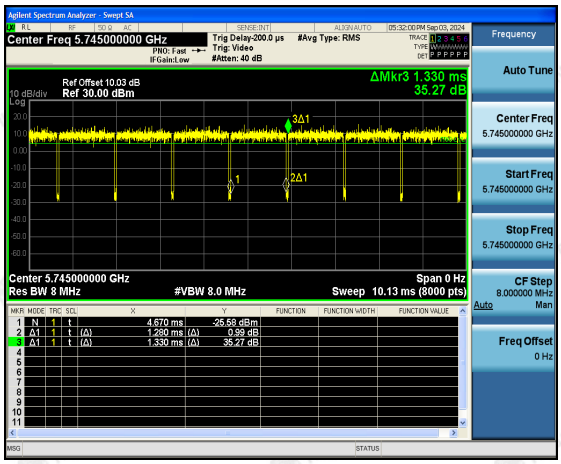
Mode	Duty Cycle	Duty Cycle Factor (dB)
802.11a	0.96	-0.18
802.11n(HT20)	0.96	-0.18
802.11n(HT40)	0.91	-0.41
802.11ac(HT20)	0.96	-0.18
802.11ac(HT40)	0.91	-0.41
802.11ac(HT80)	0.86	-0.66

Test plots as follows:

802.11a



802.11n(HT20)



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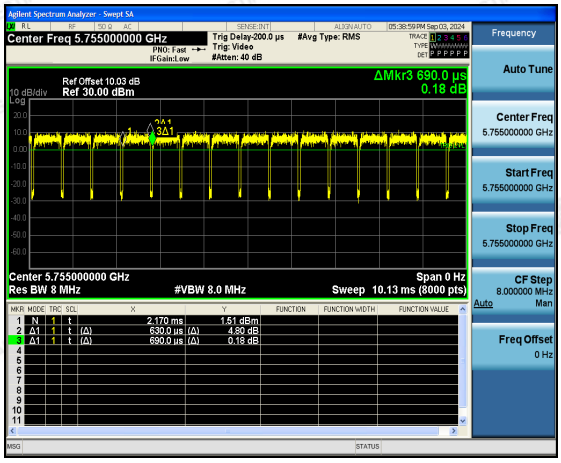
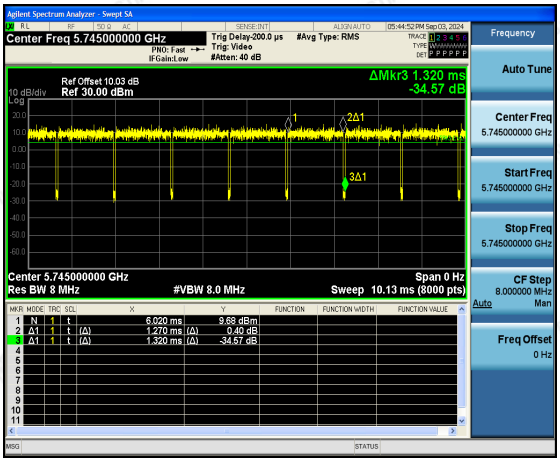
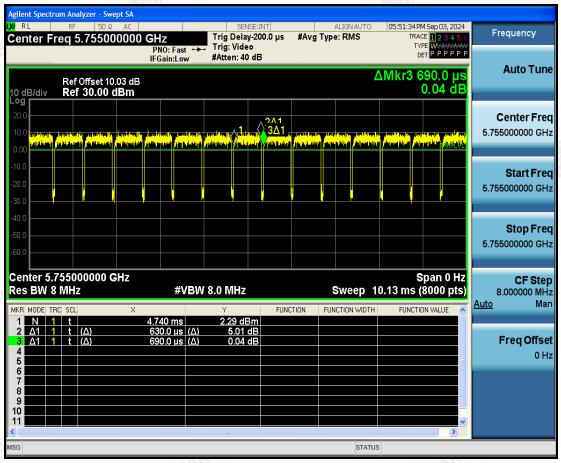
802.11n(HT40)



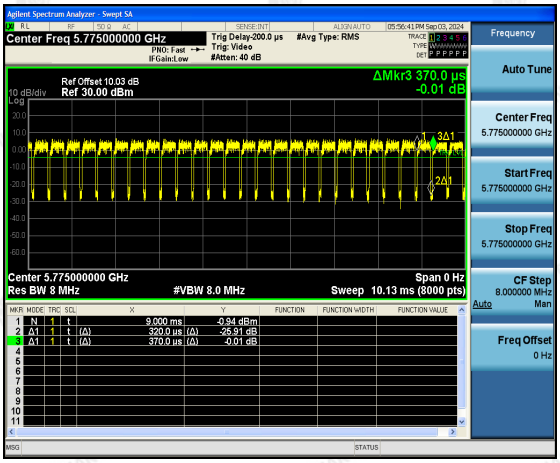
802.11ac(HT20)



802.11ac(HT40)



802.11ac(HT80)



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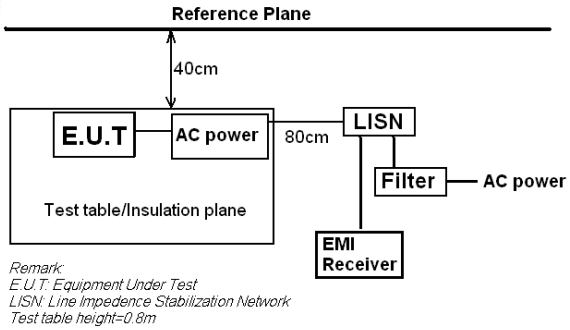
4. Test Results and Measurement Data

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	VTSD9561 F	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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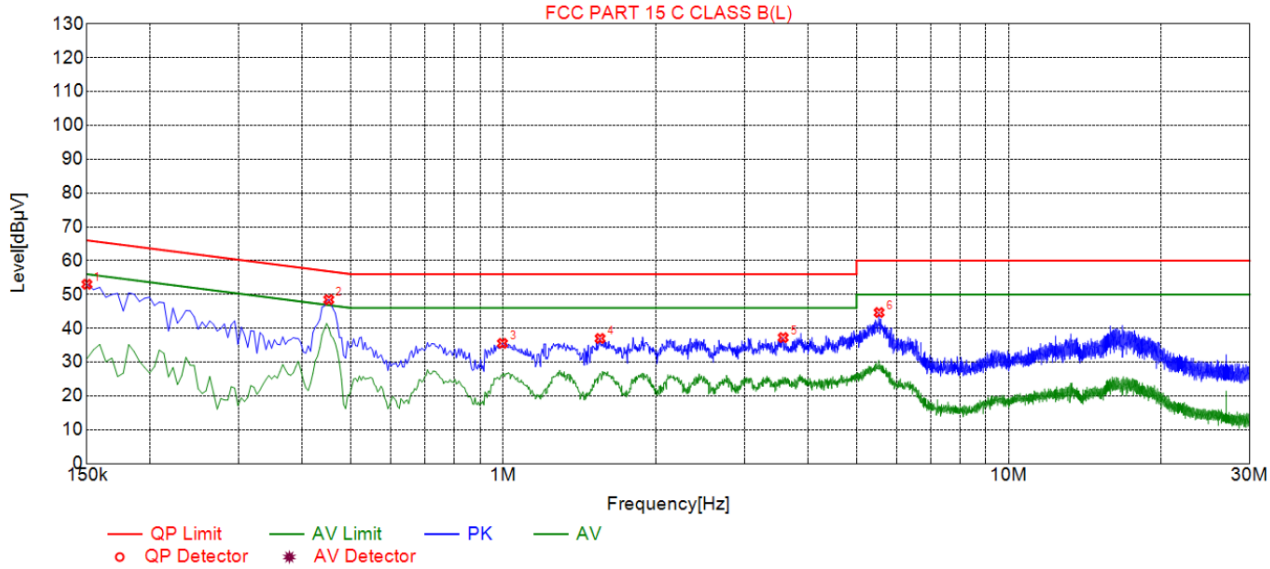
4.1.3. Test data

Test Specification: Line



Suspected List								
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1500	53.02	19.83	66.00	12.98	32.69	PK	L
2	0.4515	48.46	19.85	56.85	8.39	28.11	PK	L
3	0.9960	35.55	19.87	56.00	20.45	15.18	PK	L
4	1.5540	37.00	19.93	56.00	19.00	16.57	PK	L
5	3.5790	37.26	20.09	56.00	18.74	16.67	PK	L
6	5.5410	44.67	20.11	60.00	15.33	24.06	PK	L

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

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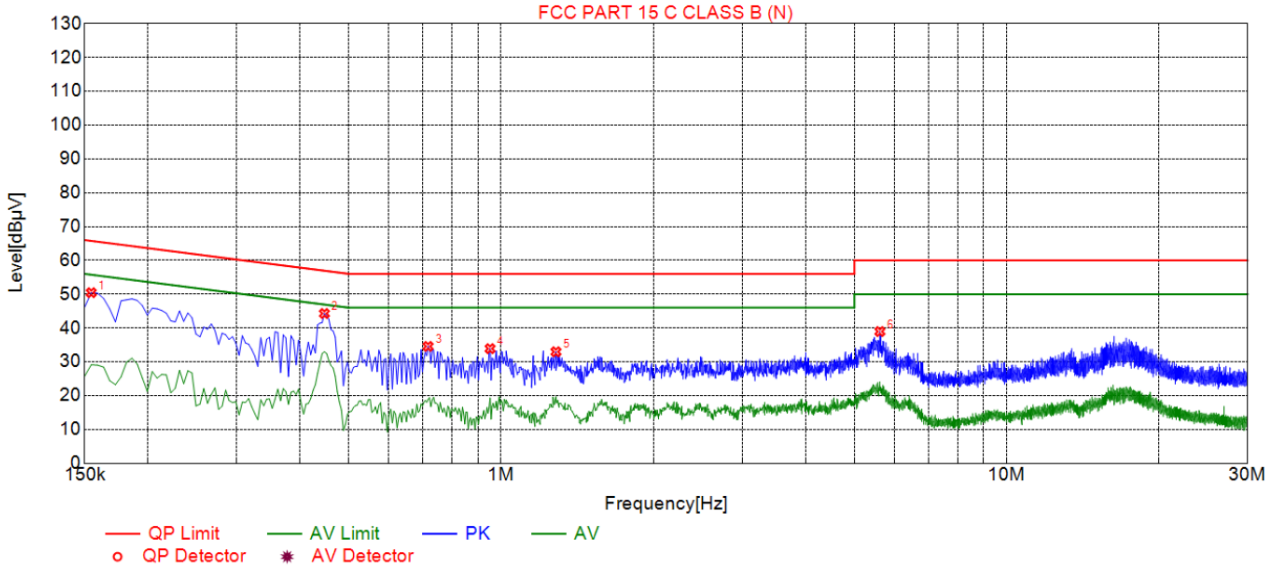
Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Reading [dBµV]	Detector	Type
1	0.1545	50.44	19.73	65.75	15.31	31.31	PK	N
2	0.4470	44.29	19.74	56.93	12.64	25.15	PK	N
3	0.7170	34.56	19.74	56.00	21.44	15.42	PK	N
4	0.9510	33.89	19.74	56.00	22.11	14.75	PK	N
5	1.2840	32.96	19.78	56.00	23.04	13.78	PK	N
6	5.6175	38.96	20.00	60.00	21.04	19.56	PK	N

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

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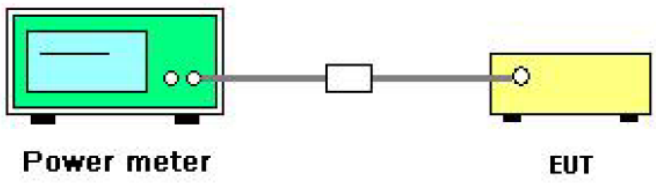
4.2. Maximum Conducted Output Power

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 3.3.23	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).*

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Test Data

Configuration Band I (5725-5850 MHz)						
Mode	Test Channel	Maximum Conducted Output Power (dBm)			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
802.11a	CH149	9.44	7.35		30	PASS
802.11a	CH157	7.51	7.87		30	PASS
802.11a	CH165	8.10	9.30		30	PASS
802.11n(HT20)	CH149	6.94	7.88	10.45	30	PASS
802.11n(HT20)	CH157	6.99	7.81	10.43	30	PASS
802.11n(HT20)	CH165	7.82	8.08	10.96	30	PASS
802.11n(HT40)	CH151	7.98	8.45	11.23	30	PASS
802.11n(HT40)	CH159	7.98	8.39	11.20	30	PASS
802.11ac(HT20)	CH149	7.50	7.96	10.75	30	PASS
802.11ac(HT20)	CH157	7.56	7.93	10.76	30	PASS
802.11ac(HT20)	CH165	8.05	8.26	11.17	30	PASS
802.11ac(HT40)	CH151	8.17	8.47	11.33	30	PASS
802.11ac(HT40)	CH159	8.14	8.39	11.28	30	PASS
802.11ac(HT80)	CH155	8.40	8.01	11.22	30	PASS

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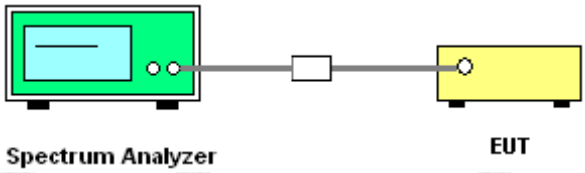
4.3. 6dB Emission Bandwidth

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 3.3.23	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).*

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4.3.3. Test data

ANT. 1

Band IV (5725 - 5850 MHz)					
Mode	Test Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	CH149	5745	16.32	0.5	PASS
802.11a	CH157	5785	16.32	0.5	PASS
802.11a	CH165	5825	16.32	0.5	PASS
802.11n(HT20)	CH149	5745	17.00	0.5	PASS
802.11n(HT20)	CH157	5785	16.84	0.5	PASS
802.11n(HT20)	CH165	5825	16.84	0.5	PASS
802.11n(HT40)	CH151	5755	36.00	0.5	PASS
802.11n(HT40)	CH159	5795	36.24	0.5	PASS
802.11ac(HT20)	CH149	5745	16.92	0.5	PASS
802.11ac(HT20)	CH157	5785	16.88	0.5	PASS
802.11ac(HT20)	CH165	5825	17.00	0.5	PASS
802.11ac(HT40)	CH151	5755	36.24	0.5	PASS
802.11ac(HT40)	CH159	5795	36.32	0.5	PASS
802.11ac(HT80)	CH155	5775	75.20	0.5	PASS

Test plots as follows:

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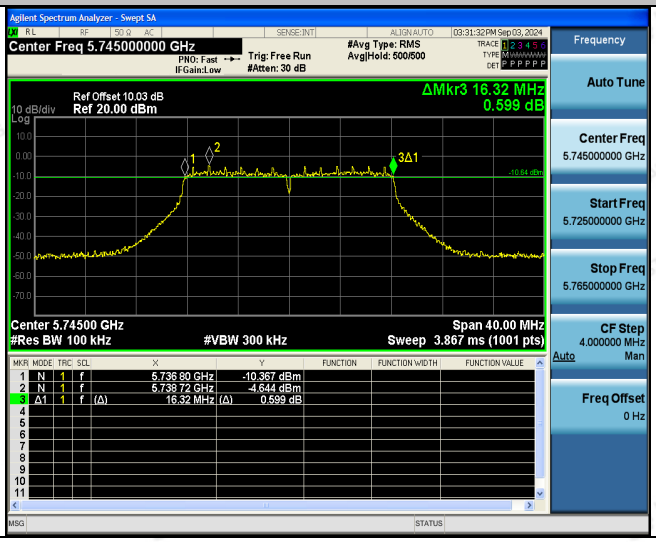
Band IV (5725 – 5850 MHz)

802.11a



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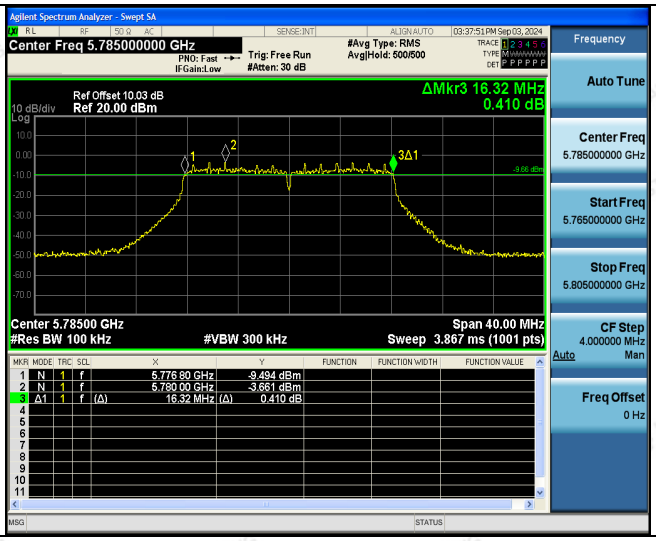

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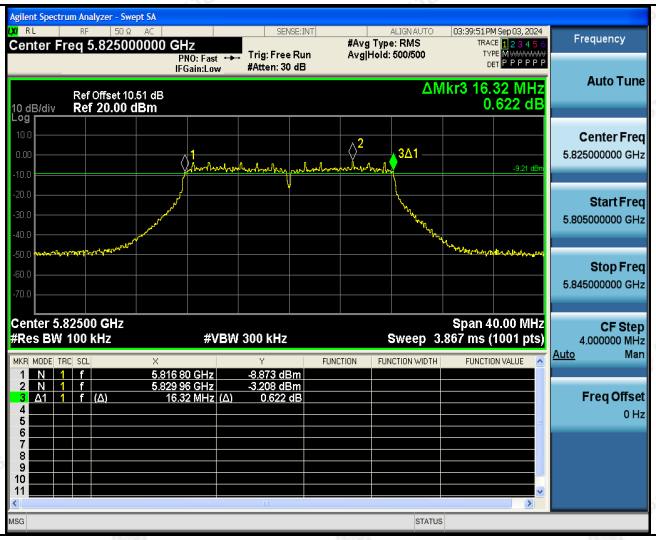

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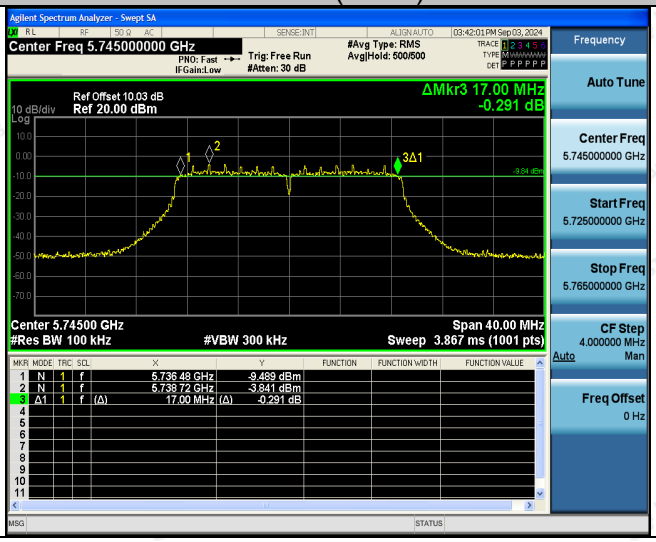
802.11n(HT20)



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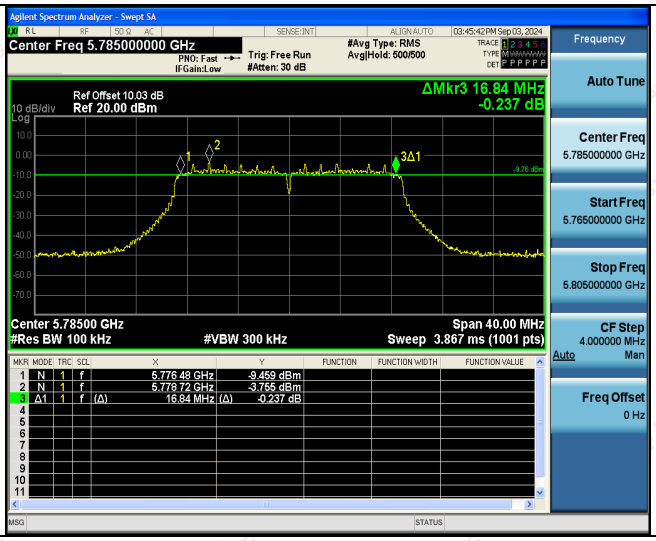

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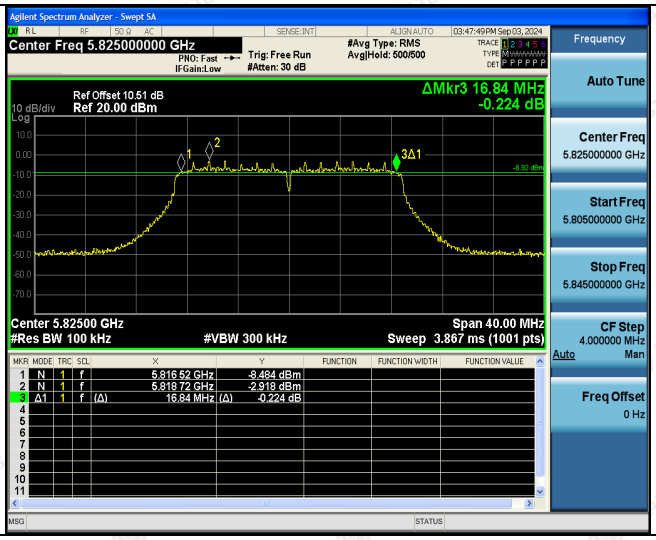

High

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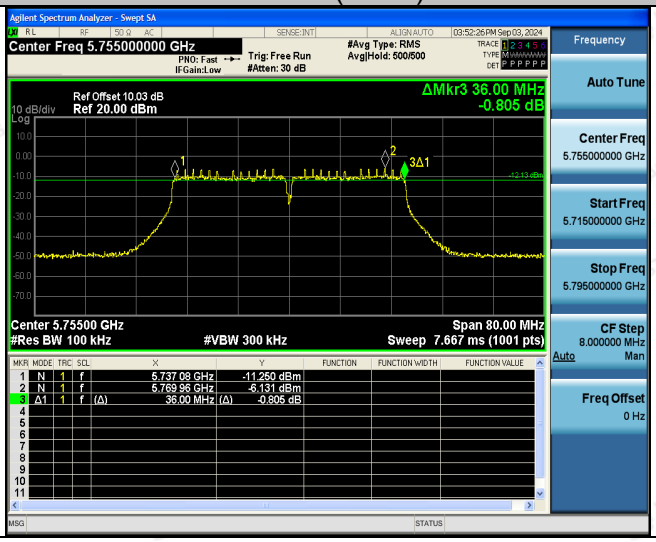
802.11n(HT40)



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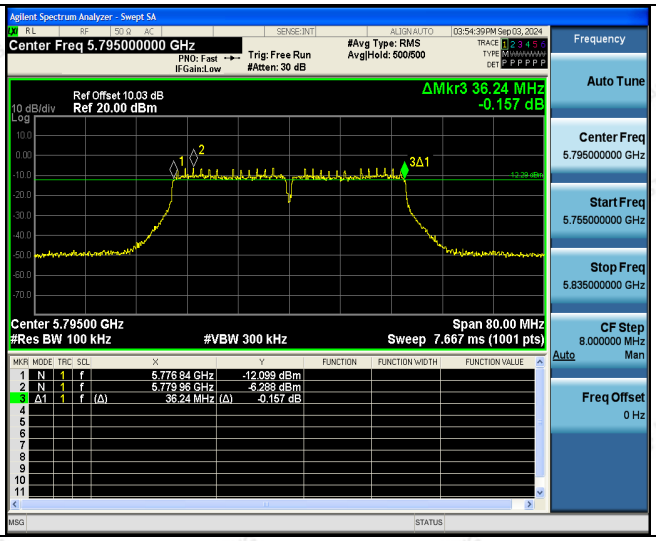

High

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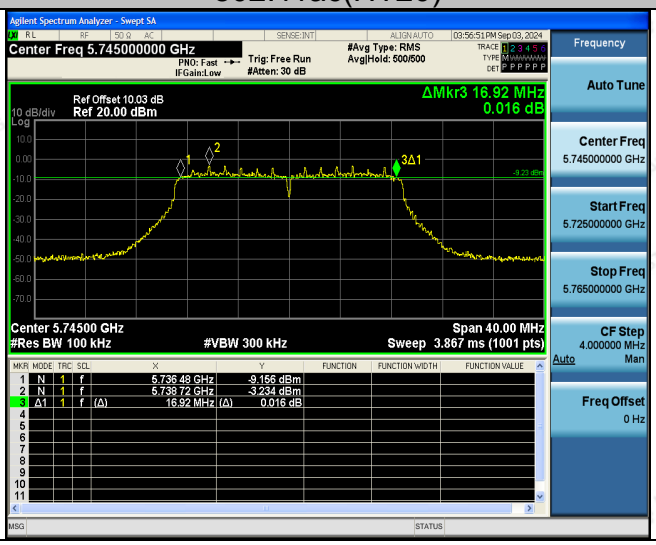
802.11ac(HT20)



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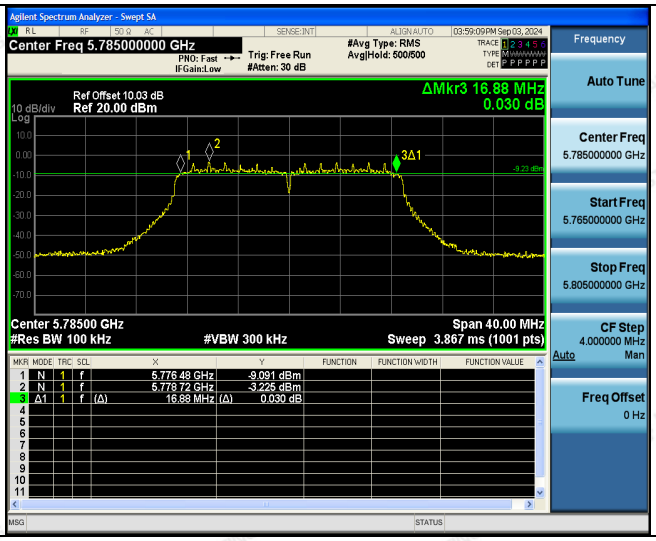

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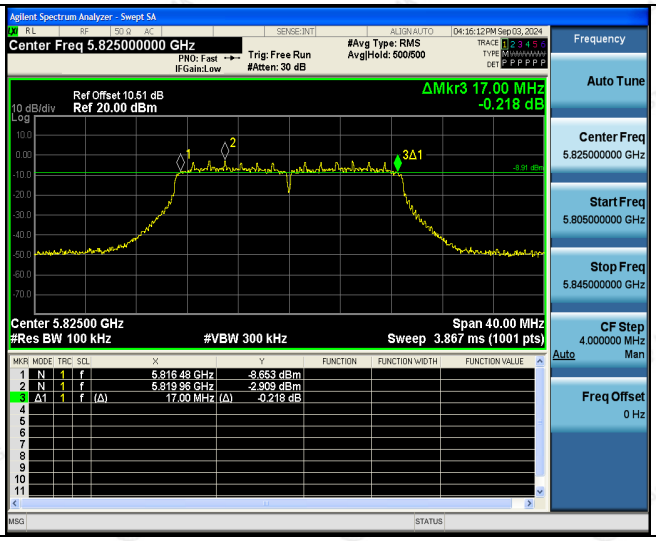

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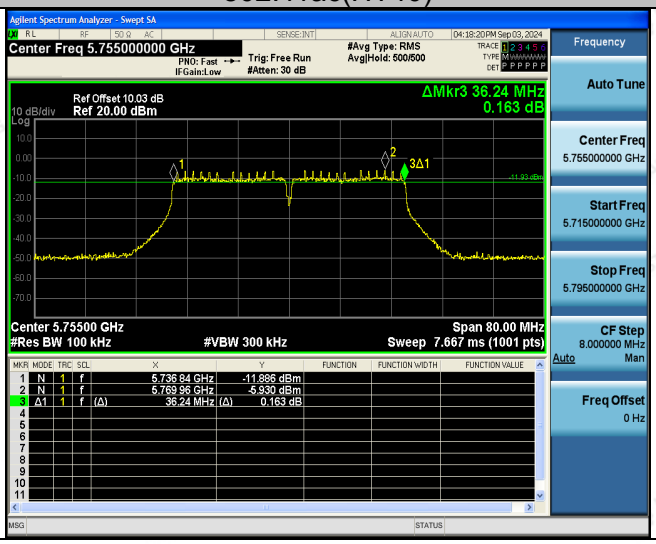
802.11ac(HT40)



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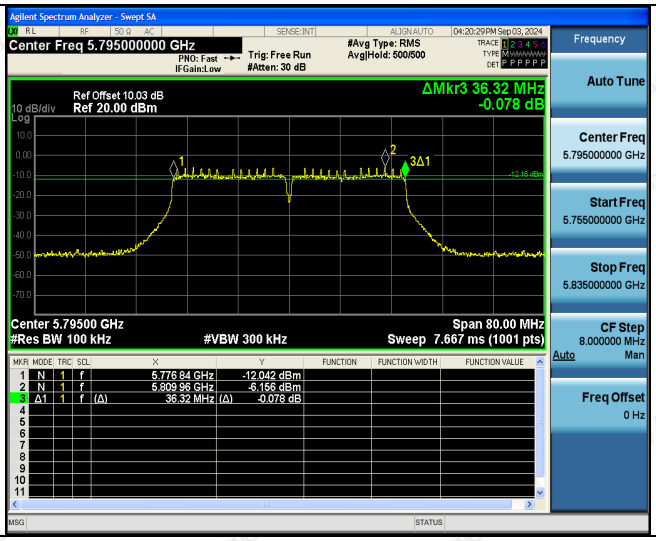
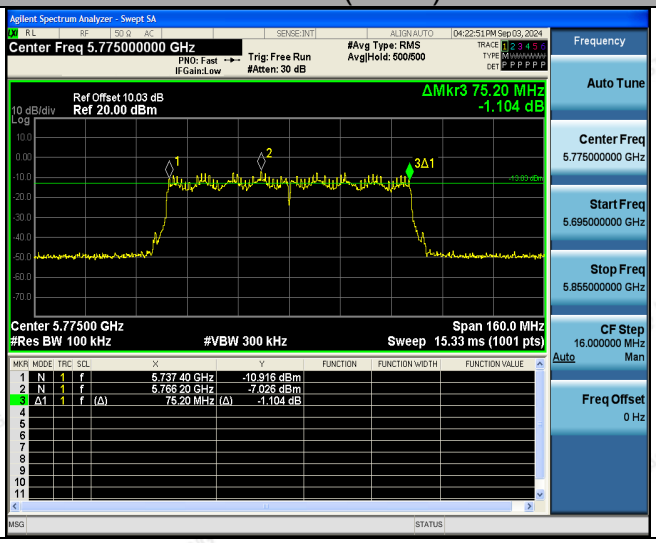


High

802.11ac(HT80)



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ANT. 2

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	CH161	5825	16.32	0.5	PASS
802.11n(HT20)	CH149	5745	17.08	0.5	PASS
802.11n(HT20)	CH157	5785	16.88	0.5	PASS
802.11n(HT20)	CH161	5825	17.00	0.5	PASS
802.11n(HT40)	CH151	5755	36.00	0.5	PASS
802.11n(HT40)	CH159	5795	36.24	0.5	PASS
802.11ac(HT20)	CH149	5745	17.00	0.5	PASS
802.11ac(HT20)	CH157	5785	16.88	0.5	PASS
802.11ac(HT20)	CH165	5825	17.12	0.5	PASS
802.11ac(HT40)	CH151	5755	36.24	0.5	PASS
802.11ac(HT40)	CH159	5795	36.24	0.5	PASS
802.11ac(HT80)	CH155	5775	75.20	0.5	PASS

Test plots as follows:

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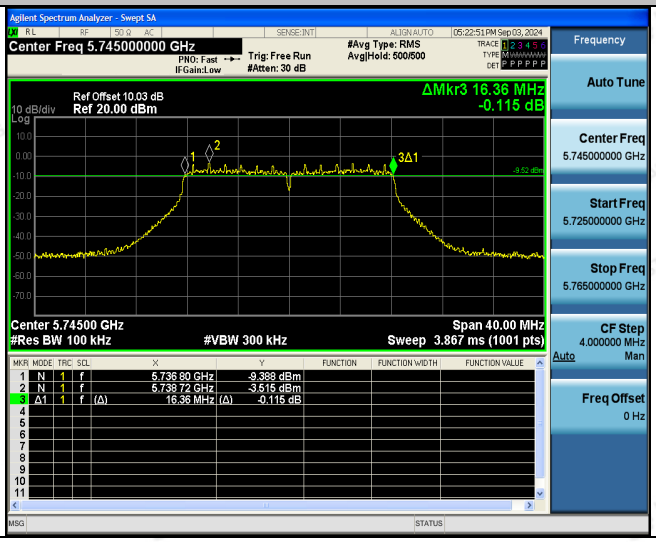
Band IV (5725 – 5850 MHz)

802.11a



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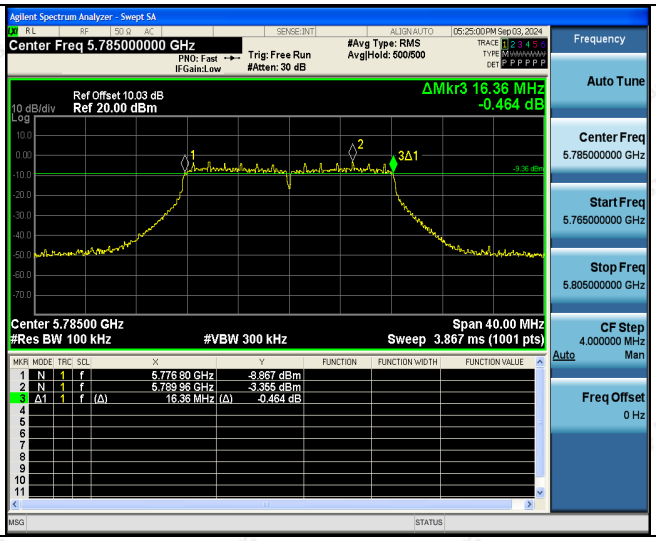

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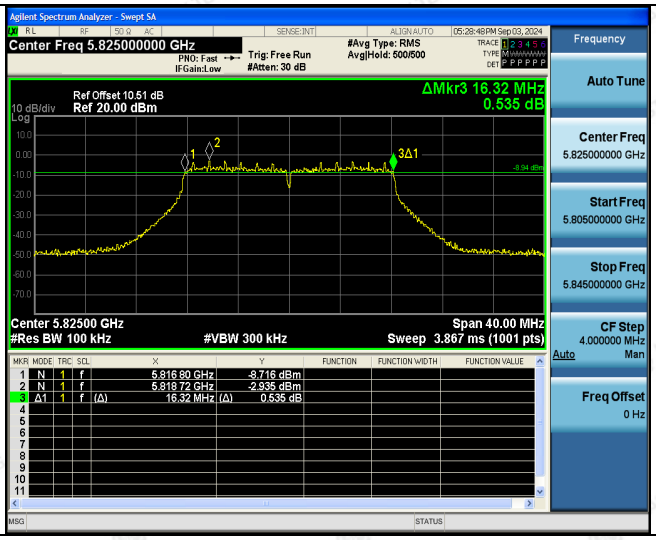

High

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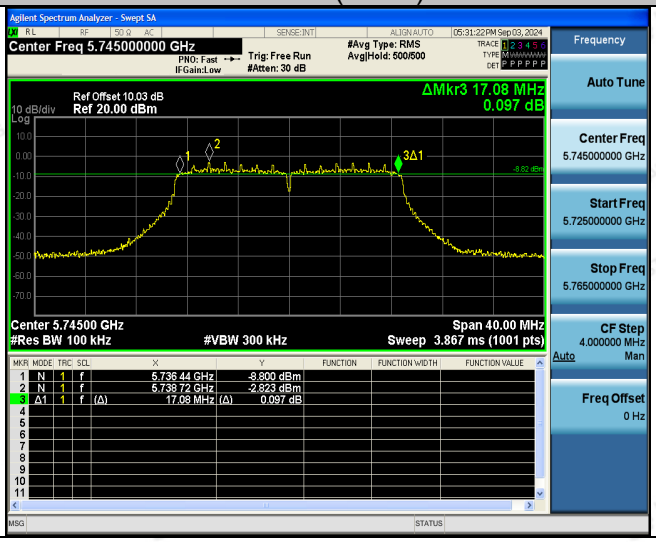
802.11n(HT20)



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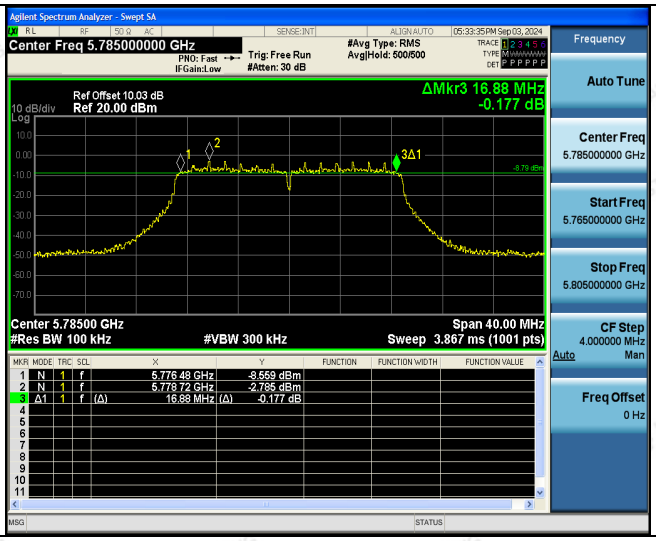

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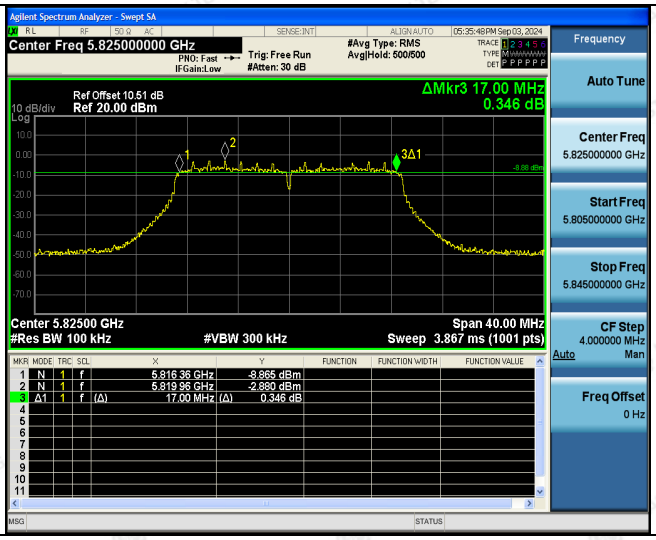

High

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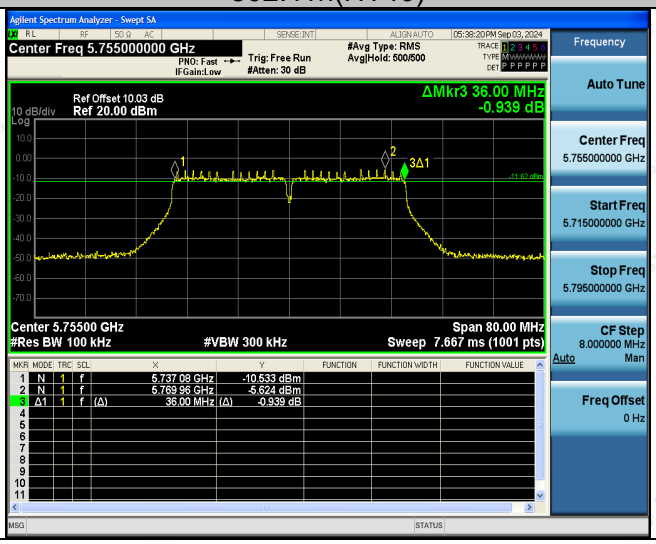
802.11n(HT40)



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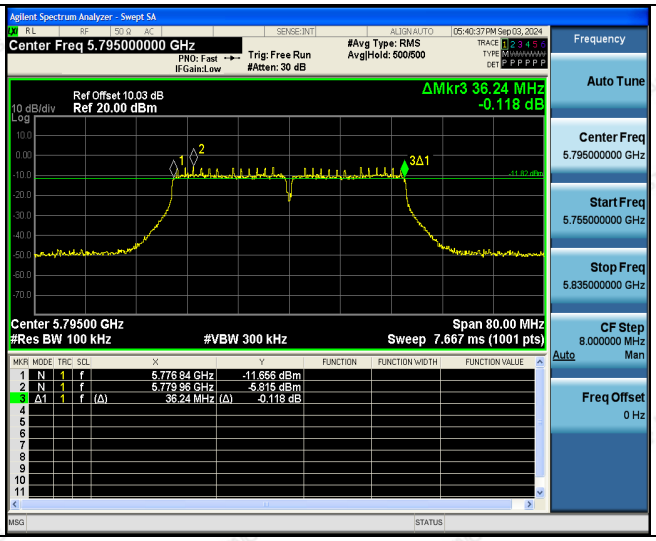

High

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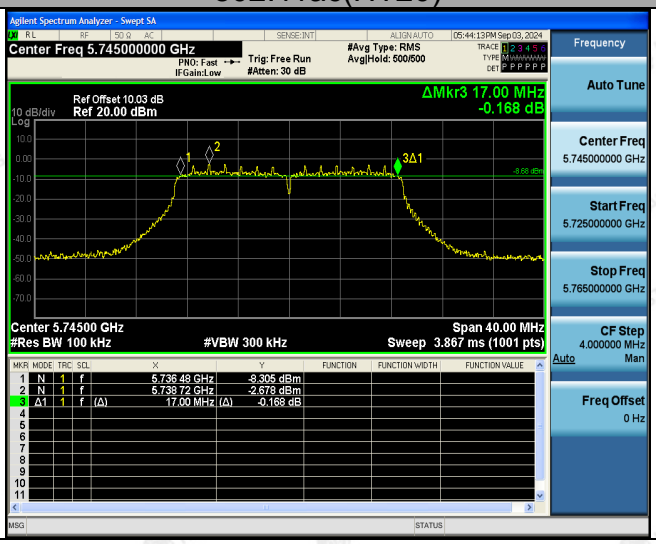
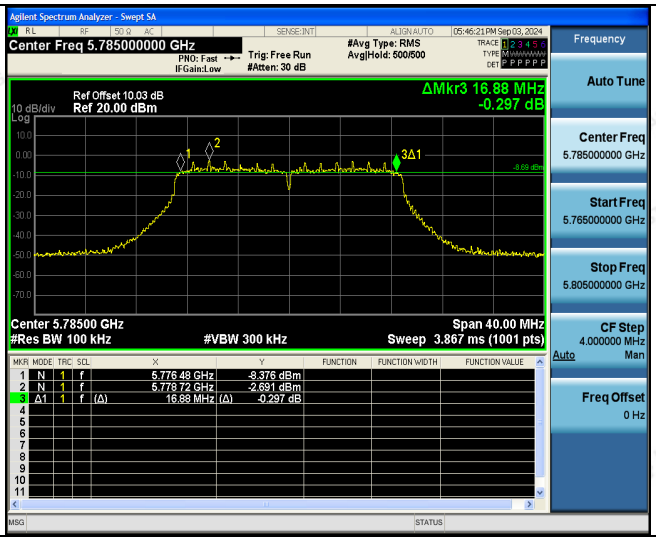
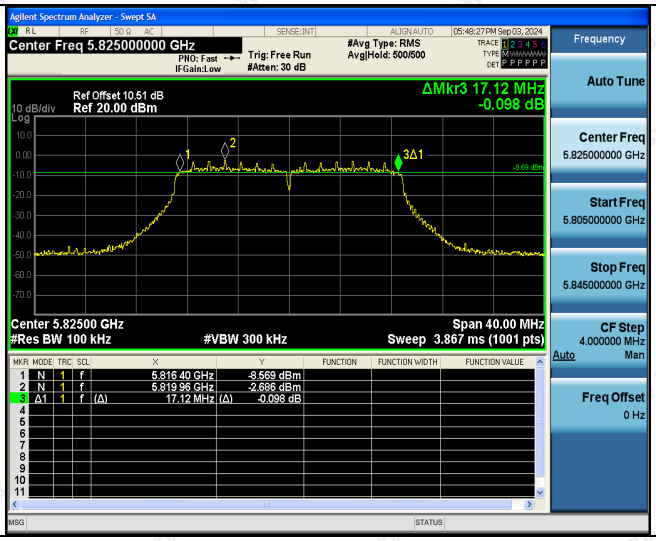
802.11ac(HT20)



Low



Mid



High

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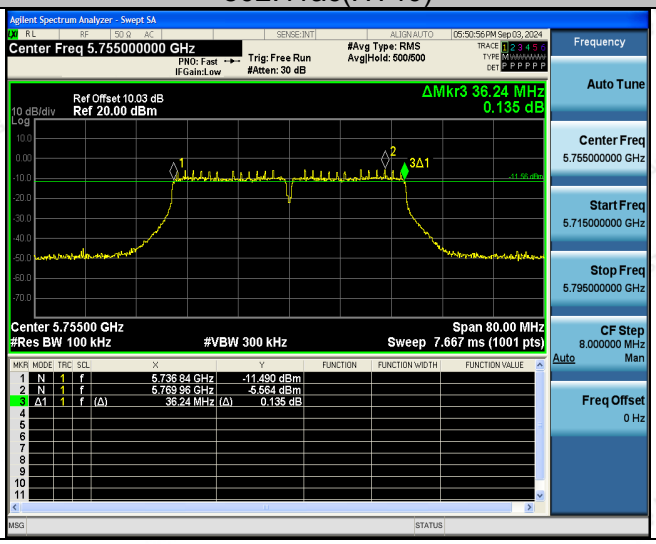
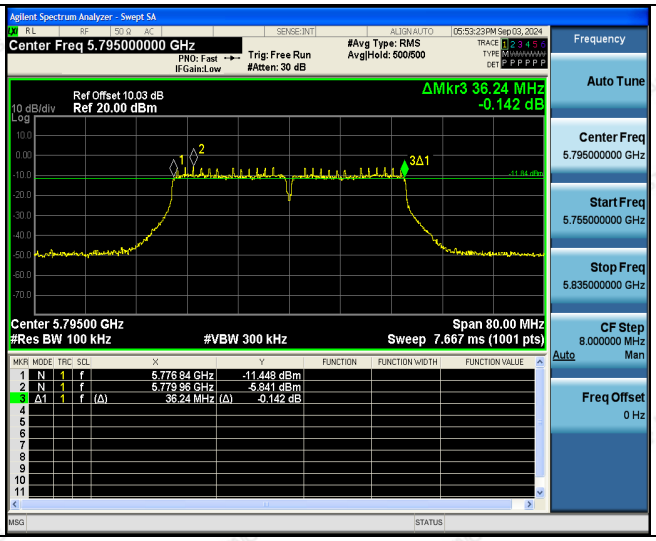
802.11ac(HT40)

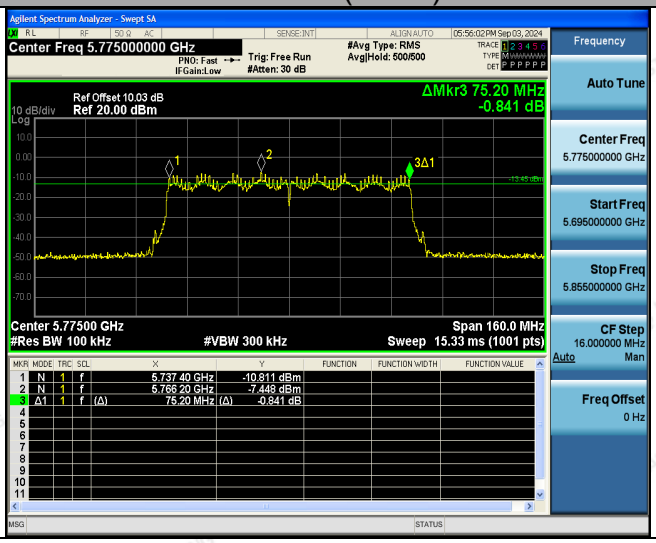


Low



High

802.11ac(HT80)



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