FCC Test Report

Test Report
On Behalf of
Circus World Displays Limited
For
4K60Hz Box to Box Audio & Video wireless sender
Model No.: TBB85TX, TBB85XTX

FCC ID: SMH-TBB85TX

Prepared For:	**Circus World Displays Limited** **4080 Montrose Rd, Niagara Falls, L2H 1J9, Canada**
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. 26, 2024 ~ Feb. 18, 2025**
Date of Report:	**Feb. 18, 2025**
Report Number:	**HK2412268084-1E**

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Test Result Certification

Applicant's Name.....: Circus World Displays Limited

Address .....: 4080 Montrose Rd, Niagara Falls, L2H 1J9, Canada

Manufacturer's Name .....: Circus World Displays Limited

Address .....: 4080 Montrose Rd, Niagara Falls, L2H 1J9, Canada

Product Description

Trade Mark .....: Nyrius

Product Name.....: 4K60Hz Box to Box Audio & Video wireless sender

Model and/or Type Reference : TBB85TX, TBB85XTX

Standards .....: FCC Rules and Regulations Part 15 Subpart E Section 15.407
ANSI C63.10: 2020

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Date of Test .....:

Date (s) of Performance of Tests .....: **Dec. 26, 2024 ~ Feb. 18, 2025**

Date of Issue.....: **Feb. 18, 2025**

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	Feb. 18, 2025	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)	N/A
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a)	PASS
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	4K60Hz Box to Box Audio & Video wireless sender
Model Name	TBB85TX
Series Model(s)	TBB85XTX
Model Difference	All model's the function, software and electric circuit are the same, only with product model named different. Test sample model: TBB85TX.
Trade Mark	Nyrius
FCC ID	SMH-TBB85TX
Operation Frequency	IEEE 802.11a/n/ac(HT20) 5.180GHz-5.240GHz IEEE 802.11n/ac(HT40) 5.190GHz-5.230GHz IEEE 802.11ac(HT80) 5.210GHz
Modulation Technology	IEEE 802.11a/n/ac
Modulation Type	256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Antenna Type	External Antenna
Antenna Gain	Antenna 1: 4.89dBi Antenna 2: 4.89dBi MIMO: 7.90dBi
Power Source	DC12V from adapter with AC100-240V, 50/60Hz, 1.0A Max
Power Supply	DC12V from adapter with AC100-240V, 50/60Hz, 1.0A Max
Hardware Version	V16_PLAY_V4
Software Version	V1.0

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
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

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

For 802.11a/n(HT20)/ac(HT20)

Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
36	Low	5180
40	Mid	5200
48	High	5240

For 802.11n(HT40)/ ac(HT40)

Band I (5150 - 5250 MHz)		
Channel Number	Channel	Frequency (MHz)
38	Low	5190
46	High	5230

For 802.11ac(HT80)

Band I (5150 - 5250 MHz)	
Channel Number	Frequency (MHz)
42	5210

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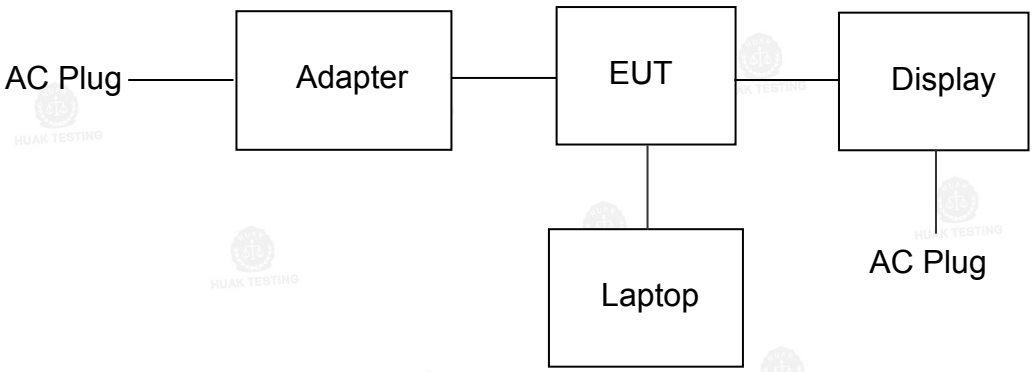
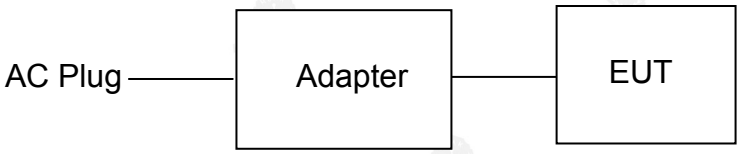
2.4 Description of Test Setup

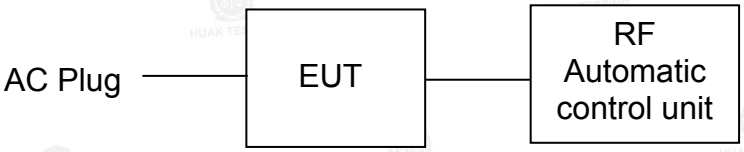
Operation of EUT during AC Conducted and Radiation below 1GHz testing:



Operation of EUT during Radiation Above 1GHz testing:



Operation of EUT during RF Conducted testing:



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

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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	4K60Hz Box to Box Audio & Video wireless sender	Nyrius	TBB85TX	N/A	EUT
2	Adapter	N/A	GQ24-120150-DU	Input: AC100-240V, 50/60Hz, 1.0A Max Output: DC12.0V, 1.5A	Accessory
3	USB Cable	N/A	N/A	Length: 100cm	Accessory
4	HDMI Cable	N/A	N/A	Length: 150cm	Accessory
5	Laptop	Lenovo	TP00096A	Input: DC 20V, 2.25~3.25A Output: 5VDC, 0.5A	Peripheral
6	Display	AOC	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, 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. General 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
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

Mode Test Duty Cycle

ANT.1:

Mode	Duty Cycle
802.11a	0.959
802.11n(HT20)	0.956
802.11n(HT40)	0.915
802.11ac(HT20)	0.919
802.11ac(HT40)	0.857
802.11ac(HT80)	0.854

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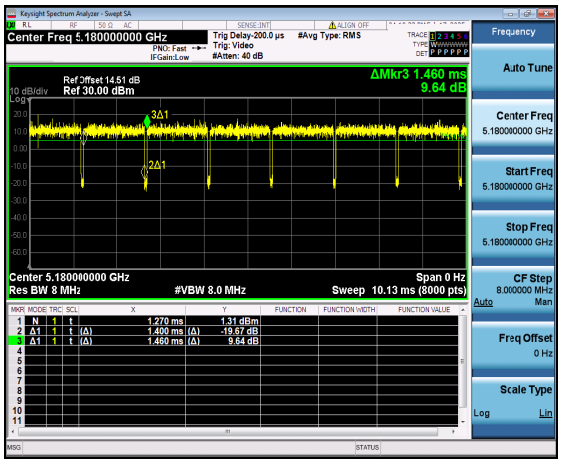
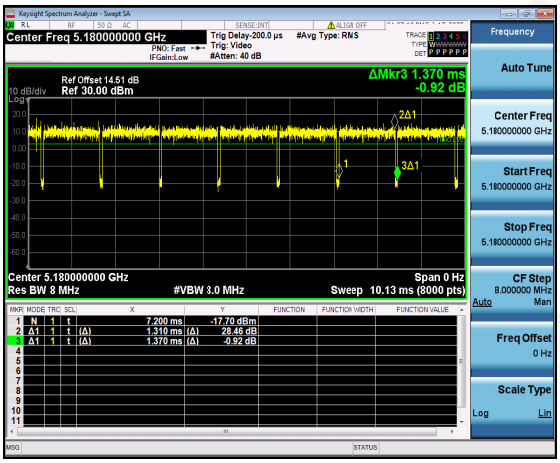
Test plots as follows:

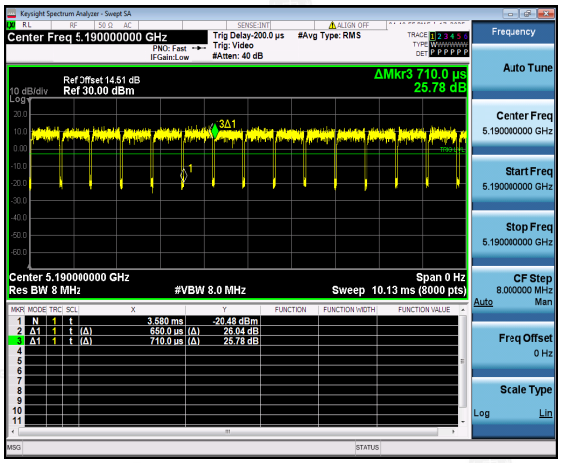
802.11a



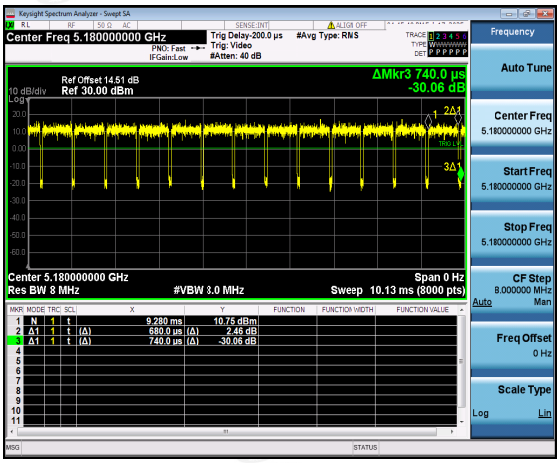
802.11n(HT20)



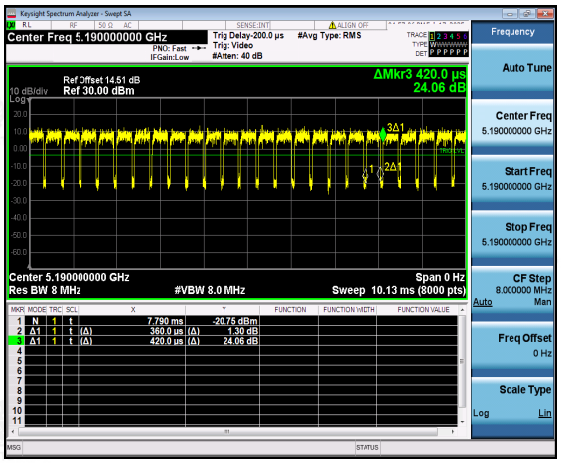
802.11n(HT40)



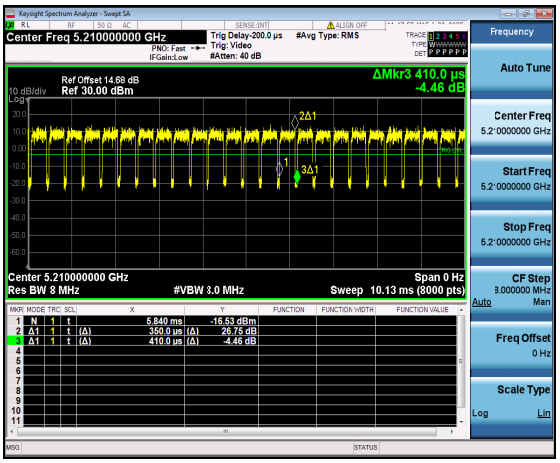
802.11ac(HT20)



802.11ac(HT40)



802.11ac(HT80)



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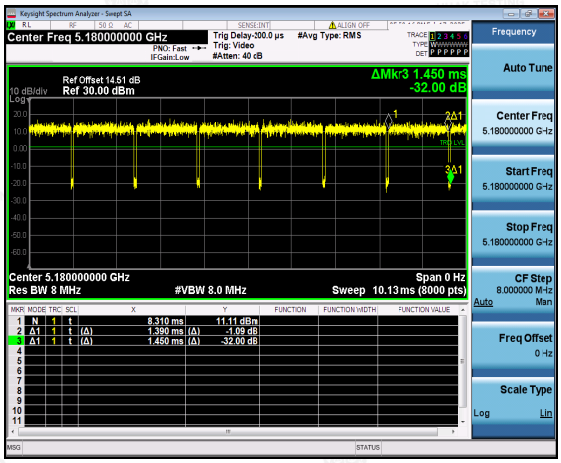
ANT.2:

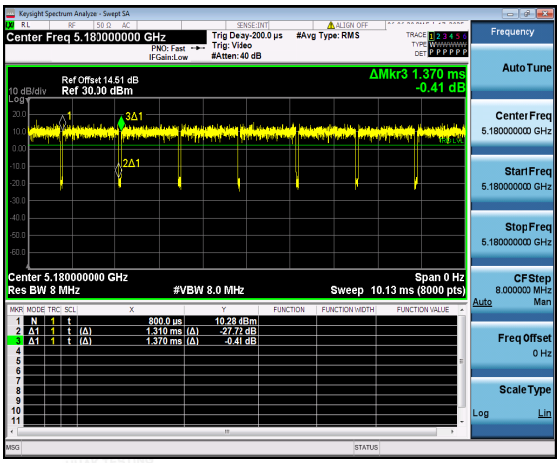
Mode	Duty Cycle
802.11a	0.959
802.11n(HT20)	0.956
802.11n(HT40)	0.901
802.11ac(HT20)	0.919
802.11ac(HT40)	0.854
802.11ac(HT80)	0.857

Test plots as follows:

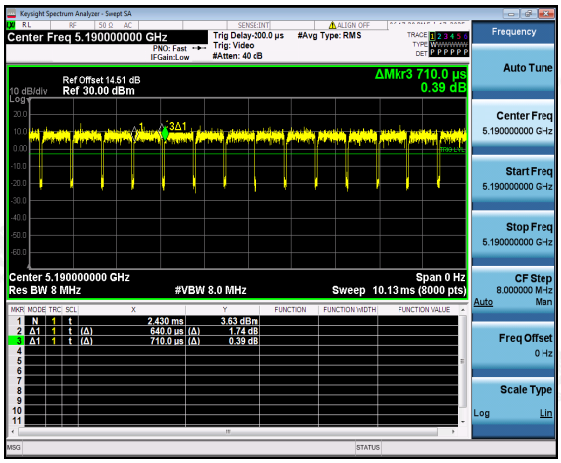
802.11a



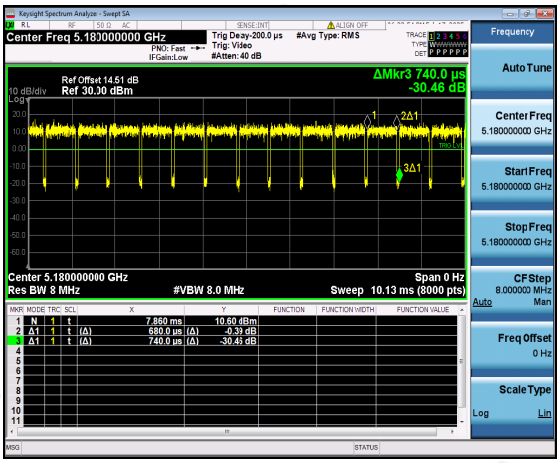
802.11n(HT20)



802.11n(HT40)



802.11ac(HT20)



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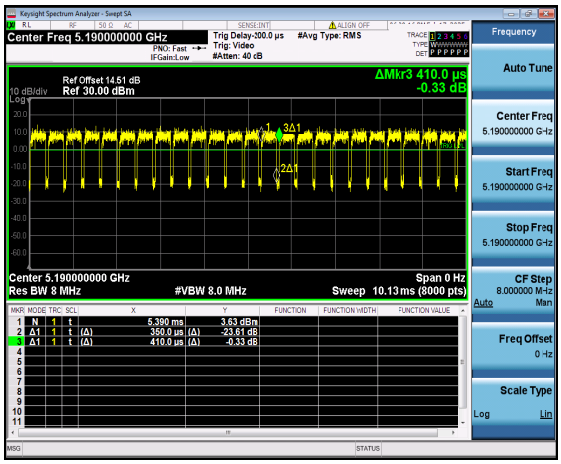
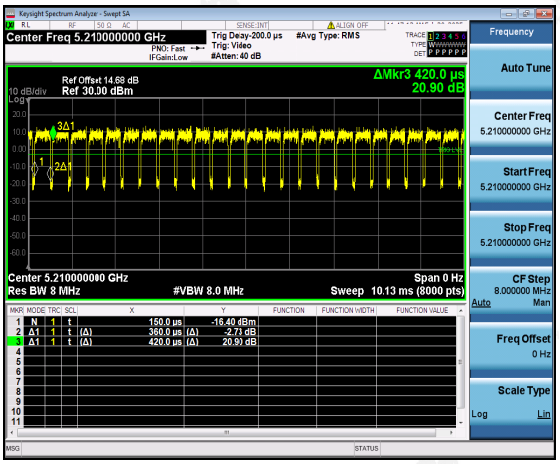
802.11ac(HT40)



802.11ac(HT80)



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4. Test Results and Measurement Data

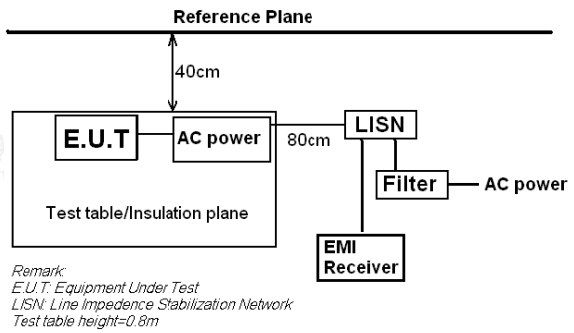
4.1 AC Conducted Emission

4.1.1 Test Specification

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10: 2020
Frequency Range:	150 kHz to 30 MHz
Receiver Setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limits:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Test Setup:



Test Mode:	Tx Mode
Test Procedure:	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: 2020 on conducted measurement.
Test Result:	Pass

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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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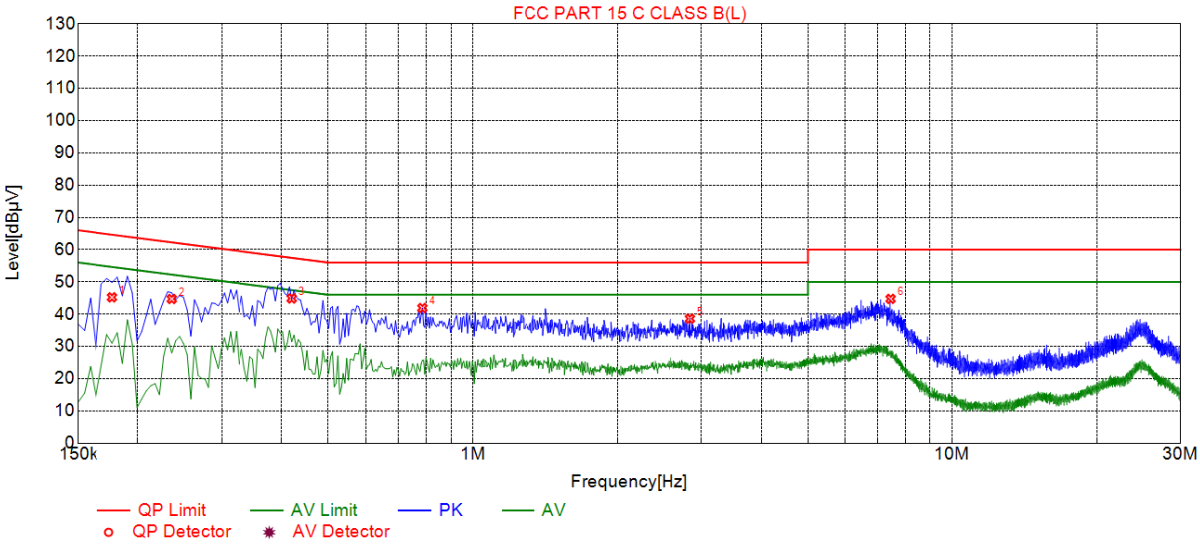
4.1.3 Test Data

Test Specification: Line:



Suspected List								
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1770	45.22	19.85	64.63	19.41	25.37	PK	L
2	0.2355	44.71	19.83	62.25	17.54	24.88	PK	L
3	0.4200	44.86	19.84	57.45	12.59	25.02	PK	L
4	0.7845	41.90	19.86	56.00	14.10	22.04	PK	L
5	2.8455	38.58	20.04	56.00	17.42	18.54	PK	L
6	7.4625	44.73	20.05	60.00	15.27	24.68	PK	L

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

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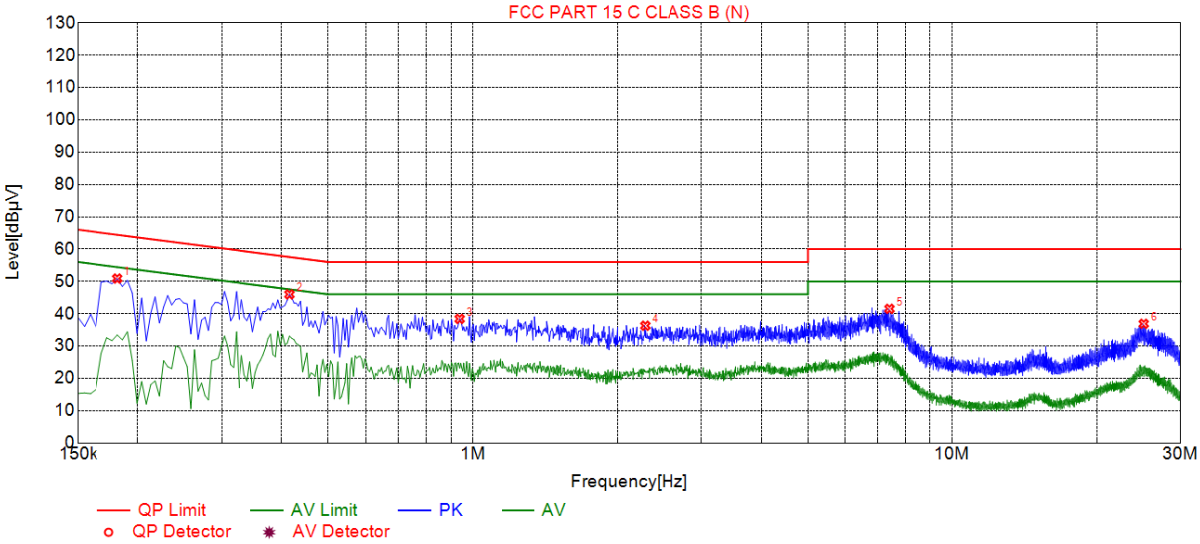
Test Specification: Neutral:



Suspected List								
NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1815	50.90	19.75	64.42	13.52	31.15	PK	N
2	0.4155	45.98	19.73	57.54	11.56	26.25	PK	N
3	0.9375	38.40	19.74	56.00	17.60	18.66	PK	N
4	2.2875	36.28	19.88	56.00	19.72	16.40	PK	N
5	7.4220	41.51	19.95	60.00	18.49	21.56	PK	N
6	25.1565	36.88	20.24	60.00	23.12	16.64	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 5150-5250: 250mW
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 RF automatic control unit by RF cable. 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
Spectrum analyzer	Agilent	N9020A	HKE-117	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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4.2.3 Test Data

Configuration Band I (5150 - 5250 MHz)					
Mode	Test Channel	Maximum Conducted Output Power (dBm)		Limit (dBm)	Result
		Antenna port 1	Antenna port 2		
802.11a	CH36	9.07	9.02	24	PASS
802.11a	CH40	9.21	9.25	24	PASS
802.11a	CH48	10.06	10.17	24	PASS
802.11n(HT20)	CH36	10.25	10.36	24	PASS
802.11n(HT20)	CH40	8.42	9.04	24	PASS
802.11n(HT20)	CH48	9.93	9.01	24	PASS
802.11n(HT40)	CH38	8.76	8.98	24	PASS
802.11n(HT40)	CH46	9.30	8.74	24	PASS
802.11ac(HT20)	CH36	8.72	8.78	24	PASS
802.11ac(HT20)	CH40	8.23	8.38	24	PASS
802.11ac(HT20)	CH48	8.98	9.32	24	PASS
802.11ac(HT40)	CH38	8.90	9.21	24	PASS
802.11ac(HT40)	CH46	9.05	9.04	24	PASS
802.11ac(HT80)	CH42	8.83	8.40	24	PASS

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Configuration Band I (5150 - 5250MHz)						
Mode	Test channel	Maximum Conducted Output Power (dBm)			Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
802.11n(HT20)	CH36	10.25	10.36	13.32	24	PASS
802.11n(HT20)	CH40	8.42	9.04	11.75	24	PASS
802.11n(HT20)	CH48	9.93	9.01	12.50	24	PASS
802.11n(HT40)	CH38	8.76	8.98	11.88	24	PASS
802.11n(HT40)	CH46	9.30	8.74	12.04	24	PASS
802.11ac(HT20)	CH36	8.72	8.78	11.76	24	PASS
802.11ac(HT20)	CH40	8.23	8.38	11.32	24	PASS
802.11ac(HT20)	CH48	8.98	9.32	12.16	24	PASS
802.11ac(HT40)	CH38	8.90	9.21	12.07	24	PASS
802.11ac(HT40)	CH46	9.05	9.04	12.06	24	PASS
802.11ac(HT80)	CH42	8.83	8.40	11.63	24	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 v02r01 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:	N/A

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
Spectrum analyzer	Agilent	N9020A	HKE-117	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).*

4.3.3 Test Data

N/A

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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
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:	PASS

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
Spectrum analyzer	Agilent	N9020A	HKE-117	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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4.4.3 Test Data

Band I
ANT. 1

Mode	Test Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Verdict
802.11a	CH36	5180	19.70	PASS
802.11a	CH40	5200	19.93	PASS
802.11a	CH48	5240	19.80	PASS
802.11n(HT20)	CH36	5180	20.06	PASS
802.11n(HT20)	CH40	5200	20.20	PASS
802.11n(HT20)	CH48	5240	20.06	PASS
802.11n(HT40)	CH38	5190	40.21	PASS
802.11n(HT40)	CH46	5230	40.32	PASS
802.11ac(HT20)	CH36	5180	19.99	PASS
802.11ac(HT20)	CH40	5200	20.25	PASS
802.11ac(HT20)	CH48	5240	19.93	PASS
802.11ac(HT40)	CH38	5190	39.77	PASS
802.11ac(HT40)	CH46	5230	39.94	PASS
802.11ac(HT80)	CH42	5210	80.72	PASS

Test plots as follows:

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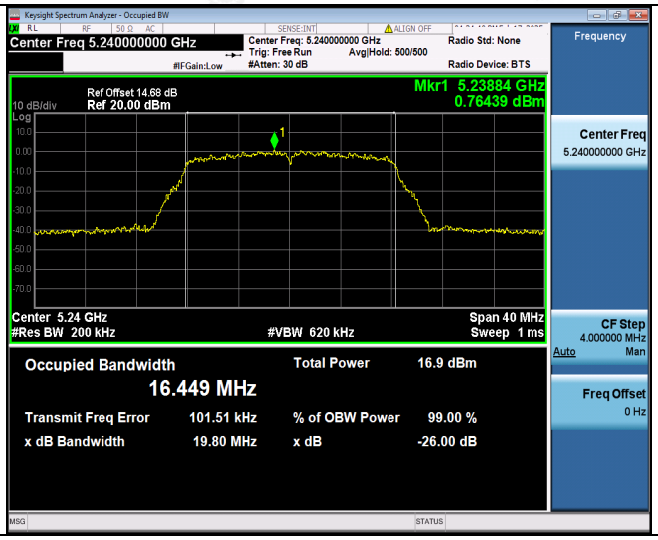
Band I (5150 – 5250MHz)

802.11a

Low

Mid



High

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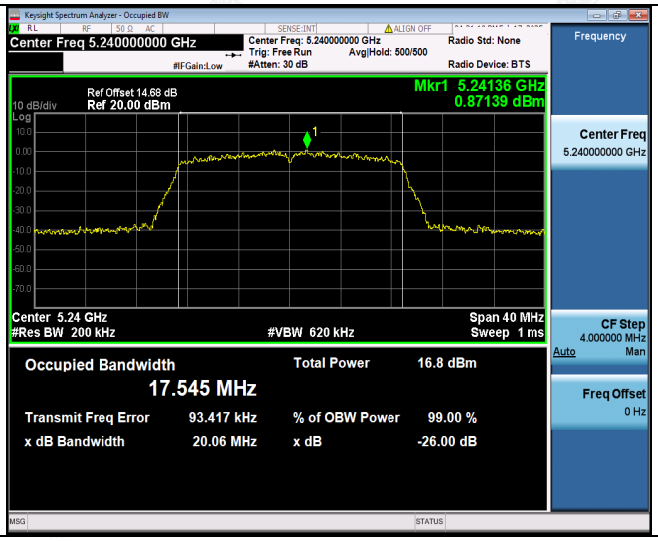
802.11n(HT20)

Low

Mid



High

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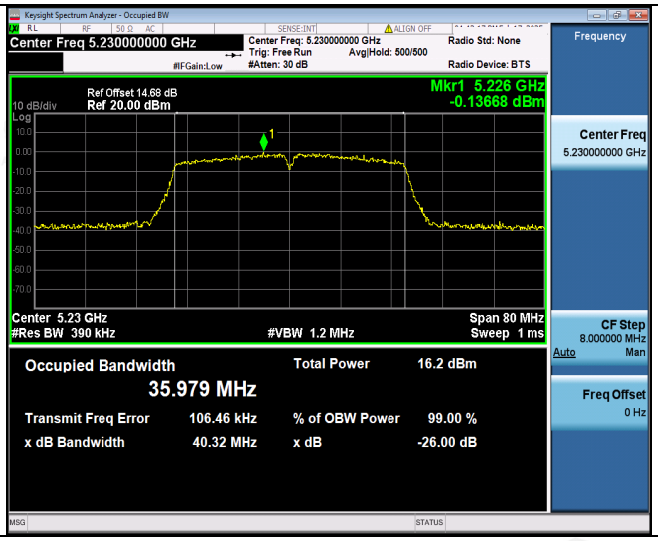
802.11n(HT40)

Low



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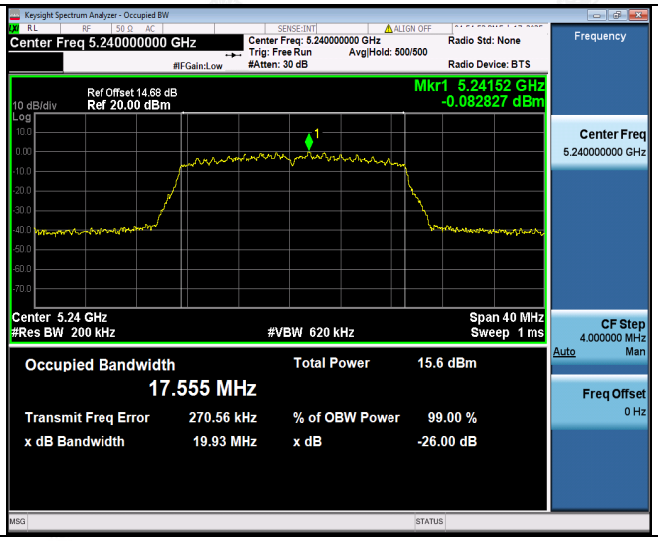
802.11ac(HT20)

Low

Mid



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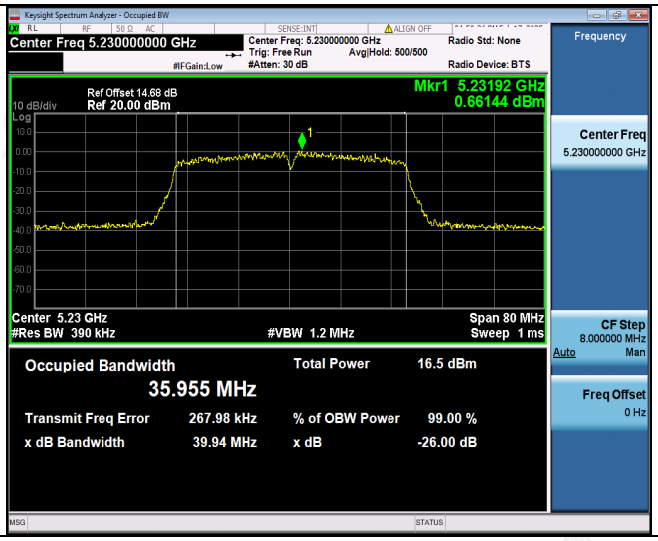
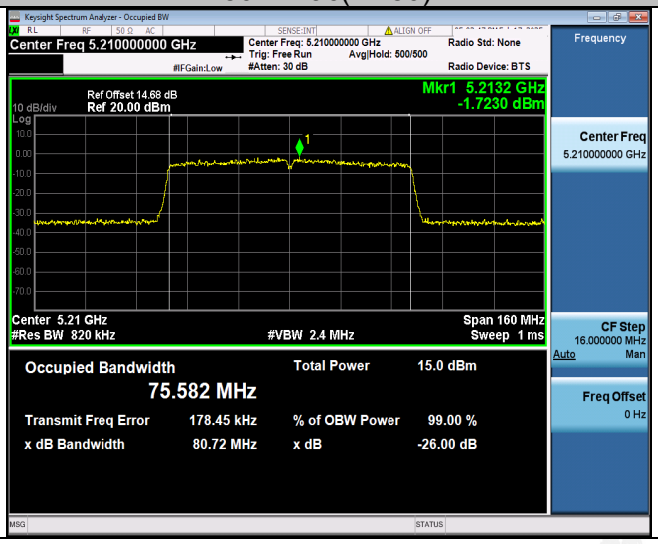
802.11ac(HT40)

Low



High

802.11ac(HT80)



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ANT. 2

Mode	Test Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Verdict
802.11a	CH36	5180	19.86	PASS
802.11a	CH40	5200	19.79	PASS
802.11a	CH48	5240	19.77	PASS
802.11n(HT20)	CH36	5180	20.14	PASS
802.11n(HT20)	CH40	5200	20.31	PASS
802.11n(HT20)	CH48	5240	20.21	PASS
802.11n(HT40)	CH38	5190	40.34	PASS
802.11n(HT40)	CH46	5230	40.21	PASS
802.11ac(HT20)	CH36	5180	20.12	PASS
802.11ac(HT20)	CH40	5200	20.00	PASS
802.11ac(HT20)	CH48	5240	20.09	PASS
802.11ac(HT40)	CH38	5190	40.36	PASS
802.11ac(HT40)	CH46	5230	40.42	PASS
802.11ac(HT80)	CH42	5210	81.22	PASS

Test plots as follows:

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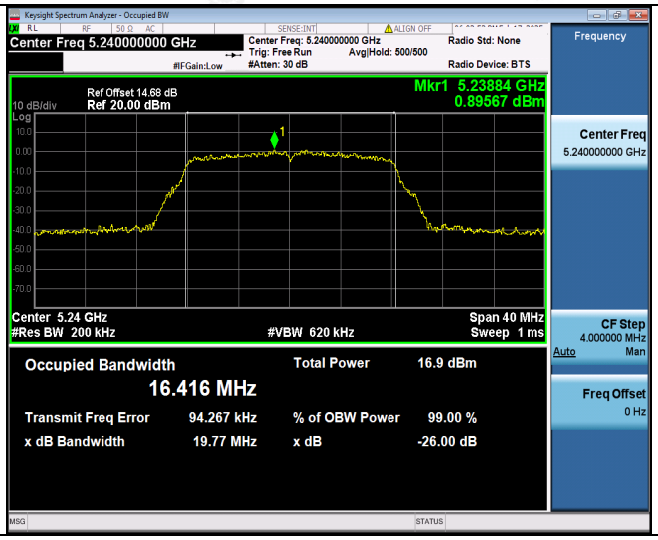
Band I (5150 – 5250 MHz)

802.11a

Low

Mid



High

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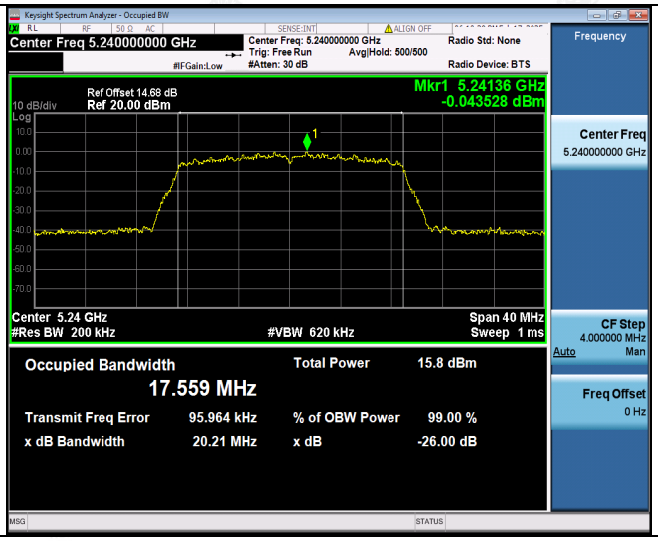
802.11n(HT20)

Low

Mid



High

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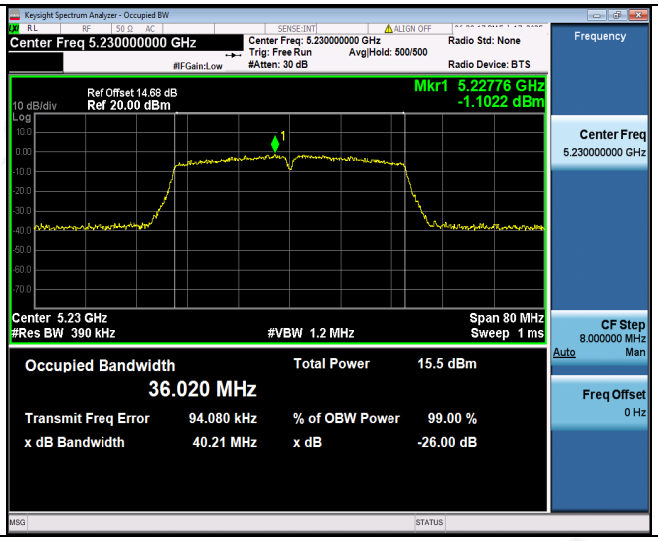
802.11n(HT40)

Low



High

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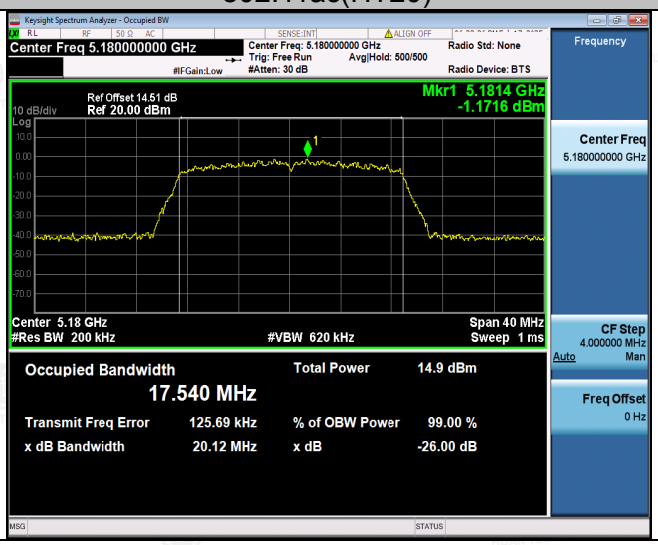
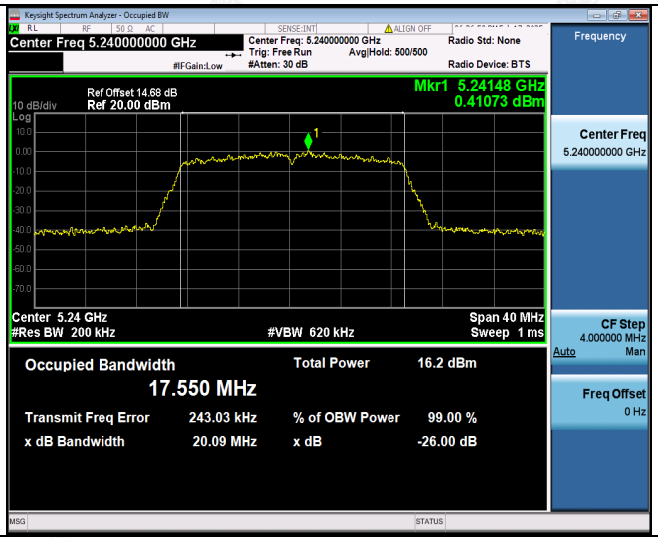
802.11ac(HT20)



Low

Mid



High

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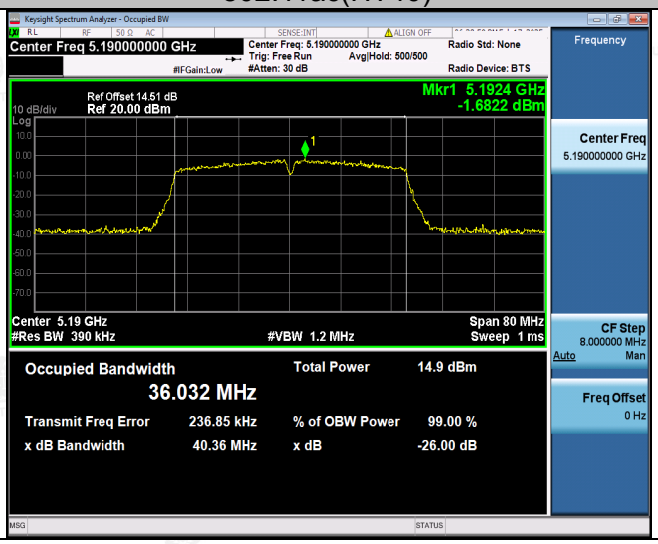
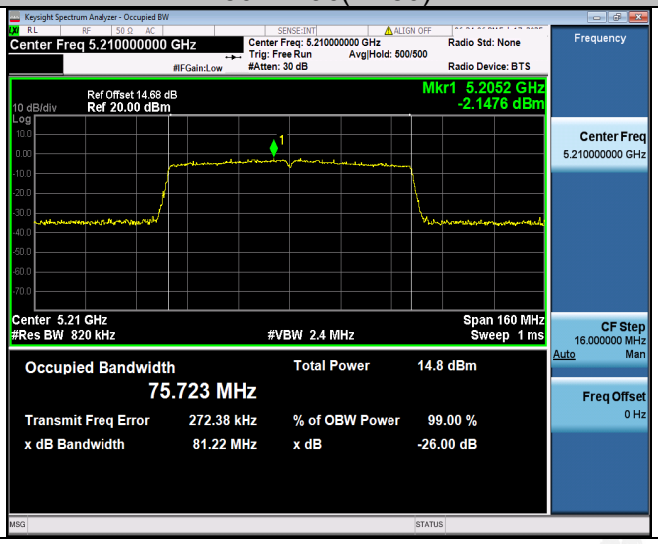
802.11ac(HT40)



Low

High

802.11ac(HT80)



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