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Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

Test Report

Report No. :	CQASZ20201200046EX-01
Applicant:	Guangzhou Zoombuying Tech Co.,LTD
Address of Applicant:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou
Manufacturer:	Guangzhou Zoombuying Tech Co.,LTD
Address of Manufacturer:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou
Equipment Under Test (EUT):	
Product:	4K Wireless Video Transmission System
All Model No.:	Mark-1000(4k), Mark-xxx (4K), Mark-xxx pro+, Mark-xxx SDI, Mark-xxx S, Mark-xxx Tx
Test Model No.:	Mark-1000(4k)
Brand Name:	RollMaster
FCC ID:	2AYL5-MARK1000
Standards:	47 CFR Part 15, Subpart E
Date of Test:	Dec. 21, 2020 to Jan. 21, 2021
Date of Issue:	Jan. 21, 2021
Test Result :	**PASS**

Tested By: Jun Li

(Jun Li)

Reviewed By: Ares Liu

(Ares Liu)

Approved By: Sheek Luo

(Sheek Luo)

SHENZHEN HUAXIA TESTING TECHNOLOGY CO., LTD
华夏准测
APPROVED

* In the configuration tested, the EUT complied with the standards specified above.

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20201200046EX-01	Rev.01	Initial report	Jan. 21, 2021

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C 15.203 /15.407(a)(1) (2)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(6)	ANSI C63.10-2013	N/A
26 dB emission bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(3)	KDB 789033 D02 v02r01 Section C.1	PASS
6 dB bandwidth	FCC 47 CFR Part 15 Subpart E Section 15.407 (e)	KDB 789033 D02 v02r01 Section C.2	PASS
Maximum conducted output power	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)	KDB 789033 D02 v02r01 Section E.3.a(Method PM)	PASS
Peak Power Spectral Density	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(3)(5)	KDB 789033 D02 v02r01 Section F	PASS
Frequency stability	FCC 47 CFR Part 15 Subpart E Section 15.407 (g)	ANSI C63.10-2013	PASS
Radiated Emissions and Band Edge Measurement	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(4)(5)(6)(7)(8)	ANSI C63.10-2013	PASS
Dynamic Frequency Selection	FCC 47 CFR Part 15 Subpart E Section 15.407 (h)	KDB 905462 D03 Client Without DFS New Rules v01r02	N/A

Note: N/A: In this whole report not application.

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4 General Information

4.1 Client Information

Applicant:	Guangzhou Zoombuying Tech Co.,LTD
Address of Applicant:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou
Manufacturer:	Guangzhou Zoombuying Tech Co.,LTD
Address of Manufacturer:	101, 863 Bld, No. 1, Kesheng Rd,Private Sci-Tech Park ,Baiyun District, Guangzhou

4.2 General Description of EUT

Product Name:	4K Wireless Video Transmission System
All Model No.:	Mark-1000(4k), Mark-xxx (4K), Mark-xxx pro+, Mark-xxx SDI, Mark-xxx S, Mark-xxx Tx
Test Model No.:	Mark-1000(4k)
Trade Mark:	RollMaster
Hardware version:	V1.0
Software version:	V1.0
Operation Frequency:	5180 ~ 5240 MHz
Channel Numbers:	5180 ~ 5240 MHz: 4 Channels for 802.11a, 802.11n, 802.11ac 2 Channels for 802.11n40 , 802.11ac 40
Type of Modulation:	IEEE 802.11a/IEEE 802.11n/IEEE 802.11ac: OFDM
Product Type:	☒ Mobile ☐ Portable ☐ Fix Location
Antenna Type:	Glue stick antenna
Antenna Gain:	Antenna 1: 3dBi Antenna 2: 3dBi MIMO: 6.01dBi
Power Supply:	DC7-16V or DC7.4V-lithium battery
Adapter Information:	N/A

Note:

1. For more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

2. There are many products, Only the model Mark-1000(4k) was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

3. The working voltage range of the product is DC7V-16V or DC7.4V-lithium battery, and the voltage when we test is DC12V

Operation Frequency Each of Channel							
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
For IEEE 802.11a/n-HT20/ac-VHT20 operation in the 5150 MHz to 5250 MHz band							
36	5180 MHz	40	5200 MHz	44	5220 MHz	48	5240 MHz
For IEEE 802.11n-HT40/ac-VHT40 operation in the 5150 MHz to 5250 MHz band							
38	5190 MHz	46	5230 MHz	--	--	--	--

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:

Mode	Tx/Rx Frequency	Test RF Channel Lists		
		Lowest(L)	**Middle(M)**	**Highest(H)**
IEEE 802.11a-20 IEEE 802.11n-20 IEEE 802.11ac-20	5150 MHz to 5250 MHz	Channel 36	Channel 40	Channel 48
		5180 MHz	5200 MHz	5240 MHz
IEEE 802.11n-40 IEEE 802.11ac-40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz

Note: Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.3 Test Environment and Mode

Operating Environment:	
Conduction emission	
Temperature:	23 °C
Humidity:	51 % RH
Atmospheric Pressure:	992mbar
Radiated Emission（Normal Conditions）	
Temperature:	25.1 °C~25.5 °C
Humidity:	51 % RH~55 % RH
Atmospheric Pressure:	992mbar
RF item test（**RF test room** Normal Conditions）	
Temperature:	26 °C~27.3 °C
Humidity:	58 % RH~59 % RH
Atmospheric Pressure:	992mbar

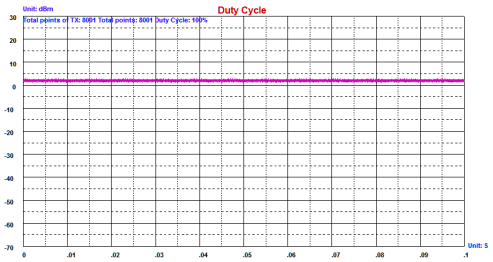
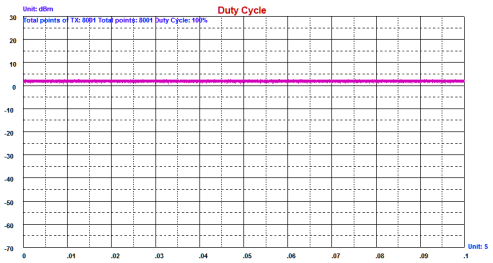
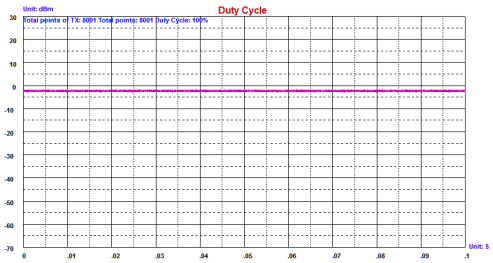
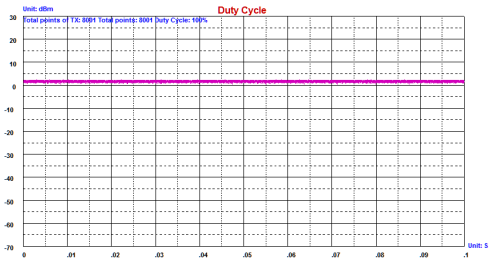
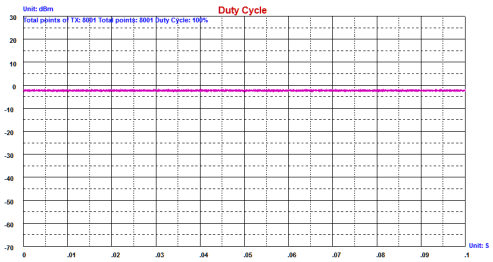
Remark:
1)The EUT just work in such extreme temperature of -20 °C to 50 °C and the extreme voltage of DC7V to DC16V, so here the EUT is tested in the temperature of -20 °C to 50 °C and the voltage of DC7V to DC16V.
VN: Normal Voltage; TN: Normal Temperature;
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

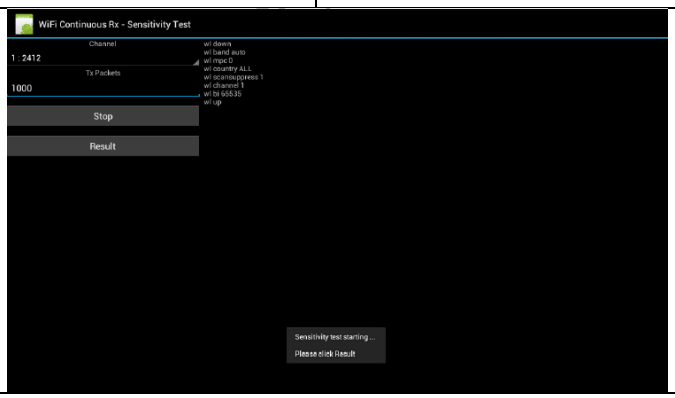
Transmitting mode

Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

Note: In the process of transmitting of EUT, the duty cycle ＞98%.

duty cycle:

802.11a-5180	
	
802.11ac-5180	802.11ac40 -5190
	
802.11n-5180	802.11n40-5190
	



4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certif cation
/	/	/	/	/

4.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.6 Test Facility

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

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.8 Deviation from Standards

None.

4.9 Abnormalities from Standard Conditions

None.

4.10 Other Information Requested by the Customer

15.407(c) requirement:

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signal ling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

Operation in the absence of information to the transmit

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling

signal of ASK message transmitting from remote device and verify whether it shall resend or

discontinue transmission. (manufacturer declare)

4.11 Equipment List

Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2020/9/22	2021/9/21
Spectrum analyzer	R&S	FSU26	CQA-038	2020/10/24	2021/10/23
Spectrum analyzer	Keysight	N9020A	CQA-105	2020/10/24	2021/10/23
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2020/9/22	2021/9/21
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2020/10/28	2021/10/27
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2020/9/22	2021/9/21
Bilog Antenna	R&S	HL562	CQA-011	2020/9/22	2021/9/21
Horn Antenna	R&S	HF906	CQA-012	2020/9/22	2021/9/21
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2020/9/22	2021/9/21
Horn Antenna	A.H.Systems, Inc.	SAS-573	CQA-104	2020/10/16	2021/10/15
Coaxial Cable (Above 1GHz)	CQA	N/A	C019	2020/9/22	2021/9/21
Coaxial Cable (Below 1GHz)	CQA	N/A	C020	2020/9/22	2021/9/21
Spectrum analyzer	Agilent	E4440A	CQA-103	2020/10/24	2021/10/23
Antenna Connector	CQA	RFC-01	CQA-080	2020/9/22	2021/9/21
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2020/9/22	2021/9/21
Power Sensor	KEYSIGHT	U2021XA	CQA-30	2020/9/22	2021/9/21
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2020/9/22	2021/9/21
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2020/9/22	2021/9/21
EMI Test Receiver	R&S	ESPI3	CQA-013	2020/9/22	2021/9/21
LISN	R&S	ENV216	CQA-003	2020/11/1	2021/10/31
Coaxial cable (9KHz~300MHz)	CQA	N/A	CQA-C009	2020/9/22	2021/9/21
high-low temperature chamber	Auchno	OJN-9606	CQA-CB2	2020/9/22	2021/9/21
DC power	KEYSIGHT	E3631A	CQA-028	2020/9/22	2021/9/21

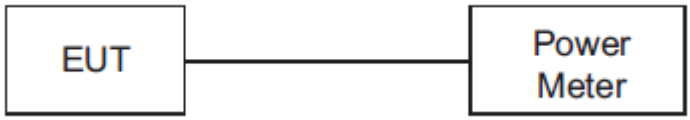
Note:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /407
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.407(a)(1) (2) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	Antenna
The antenna is Glue stick antenna.	

5.2 Conducted Average Output Power

Test Requirement:	47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)	
Test Method:	KDB 789033 D02 v02r01 Section F	
Test Setup:		
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a ; 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps of rate is the worst case of 802.11n(40MHz); 6.5Mbps of rate is the worst case of 802.11ac(20MHz) ; 13.5Mbps of rate is the worst case of 802.11ac(40MHz);Only the worst case is recorded in the report.	
Limit:	U-NII-1	24dBm
Test Results:	Pass	

Measurement Data

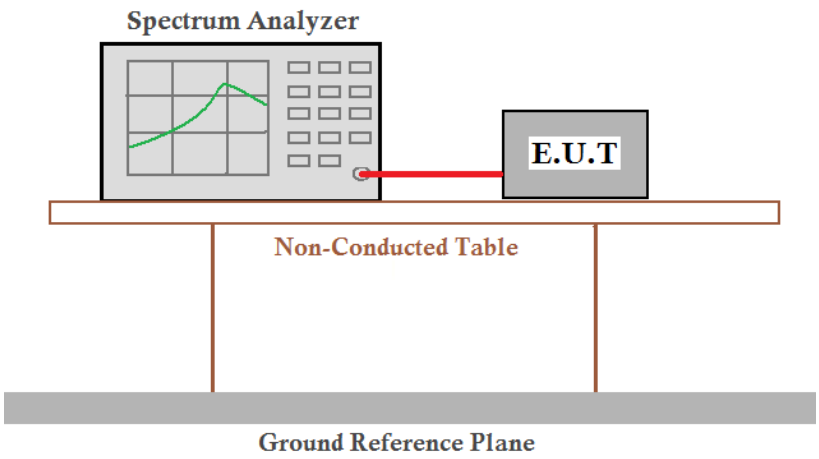
Test Mode/Channel (MHz)	Level [dBm]		Duty Cycle factor (dB)	Power [dBm]		Limit [dBm]	Verdict
	ANT1	ANT2		ANT1	ANT2		
11A-5180	5.57	5.95	0	5.57	5.95	24.00	PASS
11A-5200	5.51	6.03	0	5.51	6.03	24.00	PASS
11A-5240	5.61	5.87	0	5.61	5.87	24.00	PASS
11N20-5180	5.61	6.12	0	5.61	6.12	24.00	PASS
11N20-5200	5.90	6.12	0	5.90	6.12	24.00	PASS
11N20-5240	5.80	5.67	0	5.80	5.67	24.00	PASS
11N40-5190	4.68	5.14	0	4.68	5.14	24.00	PASS
11N40-5230	4.65	4.75	0	4.65	4.75	24.00	PASS
11AC20-5180	5.92	5.36	0	5.92	5.36	24.00	PASS
11AC20-5200	5.90	5.30	0	5.90	5.30	24.00	PASS
11AC20-5240	5.81	4.76	0	5.81	4.76	24.00	PASS
11AC40-5190	4.71	5.06	0	4.71	5.06	24.00	PASS
11AC40-5230	4.14	4.72	0	4.14	4.72	24.00	PASS

MIMO/CDD Maximum Conducted Output Power Measurements

Test Mode/Channel (MHz)	Level [dBm]		MIMO	Limit [dBm]	Verdict
	ANT1	ANT2			
11N20-5180	5.61	6.12	8.88	29.99	PASS
11N20-5200	5.90	6.12	9.02	29.99	PASS
11N20-5240	5.80	5.67	8.75	29.99	PASS
11N40-5190	4.68	5.14	7.93	29.99	PASS
11N40-5230	4.65	4.75	7.71	29.99	PASS
11AC20-5180	5.92	5.36	8.66	29.99	PASS
11AC20-5200	5.90	5.30	8.62	29.99	PASS
11AC20-5240	5.81	4.76	8.33	29.99	PASS
11AC40-5190	4.71	5.06	7.90	29.99	PASS
11AC40-5230	4.14	4.72	7.45	29.99	PASS

Limit=30dBm - (6.01dBm -6dBm) = 29.99 dBm

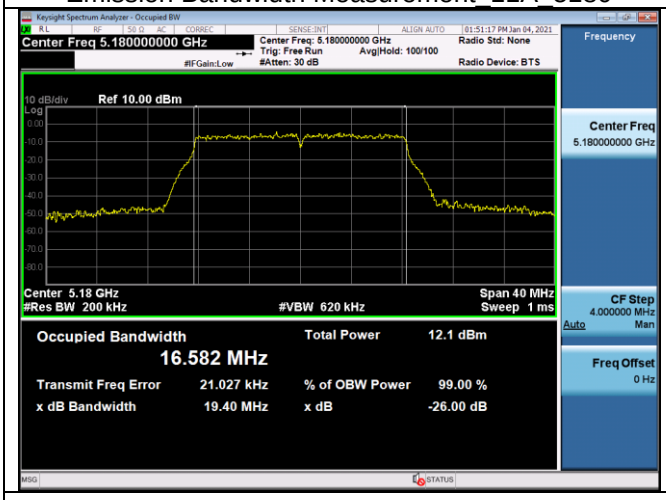
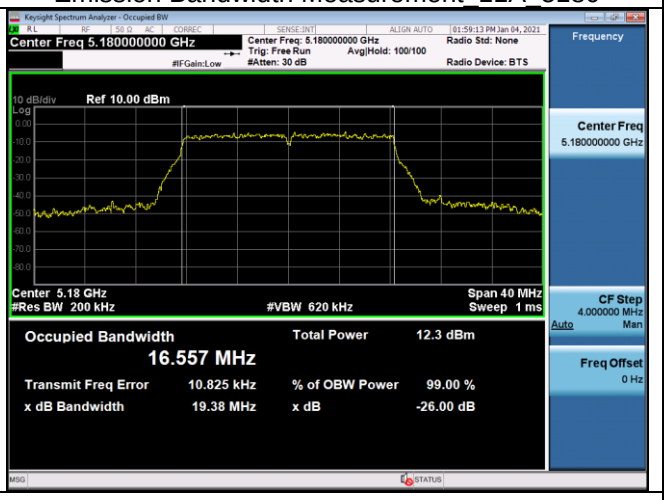
5.3 26dB Bandwidth

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)
Test Method:	KDB 789033 D02 v02r01 Section C.1
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a ; 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps of rate is the worst case of 802.11n(40MHz); 6.5Mbps of rate is the worst case of 802.11ac(20MHz) ; 13.5Mbps of rate is the worst case of 802.11ac(40MHz);
Limit:	None; for reporting purposes only.
Test Results:	Pass

Measurement Data

Test Mode	Test Channel	EBW [MHz]		Limit[MHz]	Verdict
		ANT1	ANT2		
11A	5180	19.40	19.38	/	PASS
11A	5200	19.58	19.44	/	PASS
11A	5240	19.58	19.56	/	PASS
11N20	5180	19.75	19.74	/	PASS
11N20	5200	19.94	19.78	/	PASS
11N20	5240	19.68	19.73	/	PASS
11N40	5190	39.32	39.38	/	PASS
11N40	5230	39.73	39.54	/	PASS
11AC20	5180	19.89	19.77	/	PASS
11AC20	5200	19.75	19.74	/	PASS
11AC20	5240	19.85	19.85	/	PASS
11AC40	5190	39.61	39.83	/	PASS
11AC40	5230	39.45	39.42	/	PASS

Test plot as follows:

ANT1	ANT2
Emission Bandwidth Measurement_11A_5180	Emission Bandwidth Measurement_11A_5180
	
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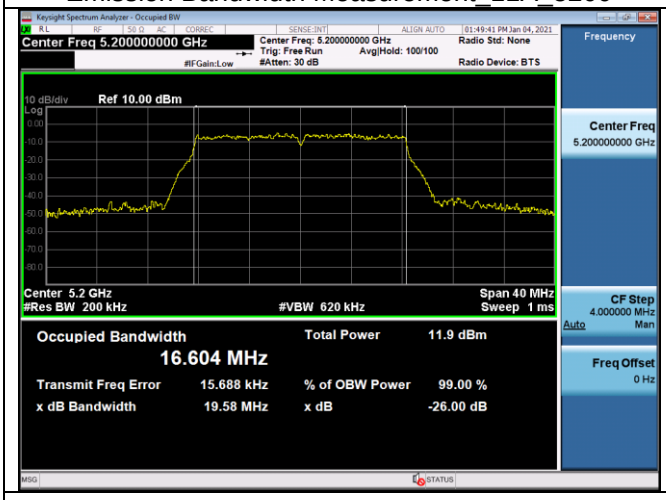
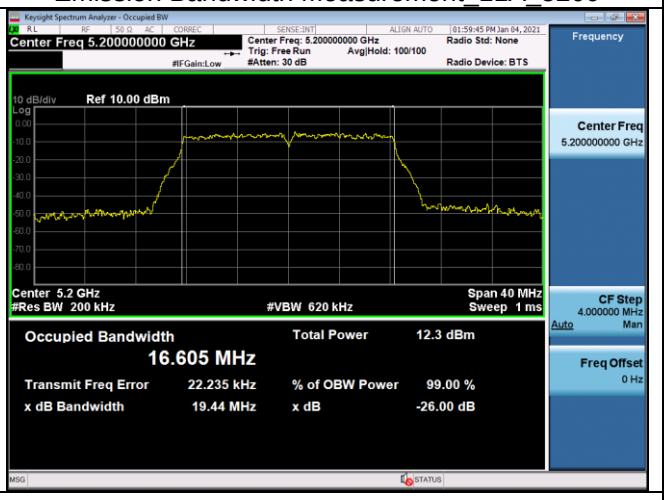
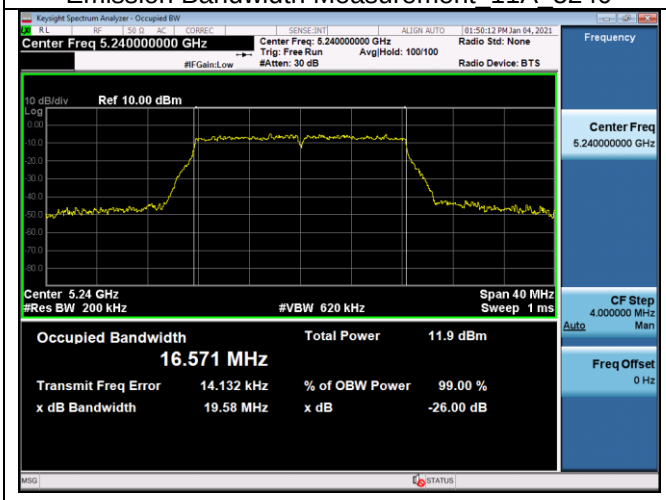
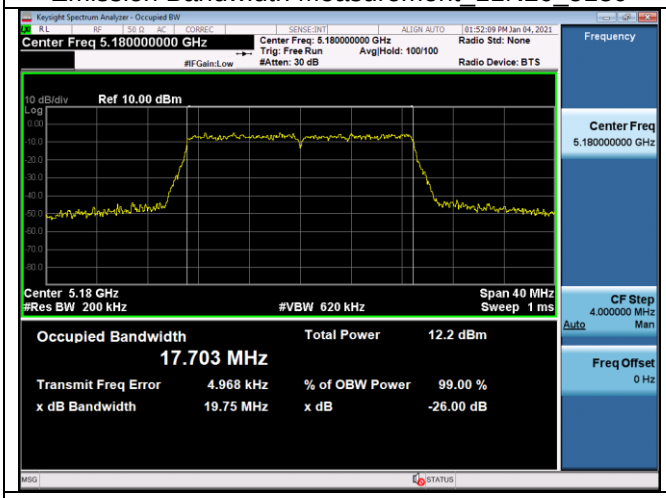
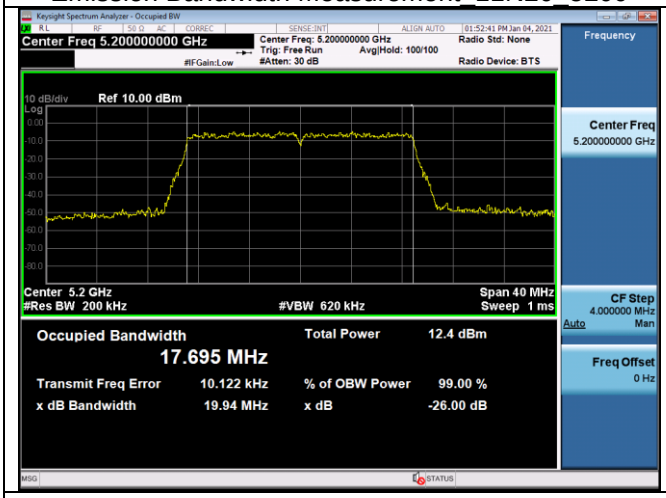
	
Emission Bandwidth Measurement_11A_5240	Emission Bandwidth Measurement_11A_5240
	

Emission Bandwidth Measurement_11N20_5180



Emission Bandwidth Measurement_11N20_5180

Emission Bandwidth Measurement_11N20_5200

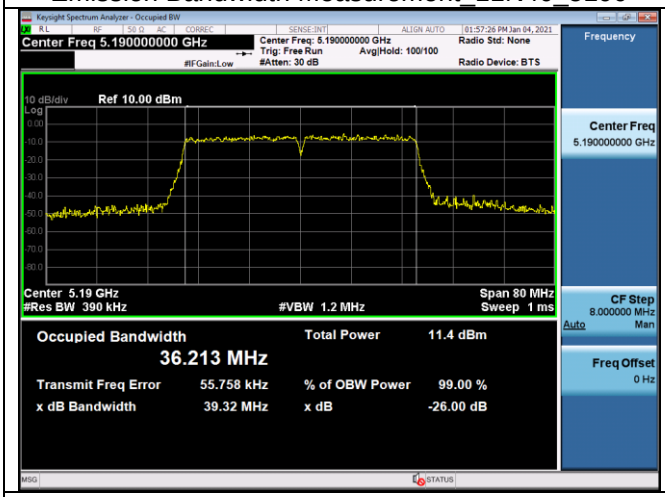


Emission Bandwidth Measurement_11N20_5200

Emission Bandwidth Measurement_11N20_5240

Emission Bandwidth Measurement_11N20_5240

Emission Bandwidth Measurement_11N40_5190



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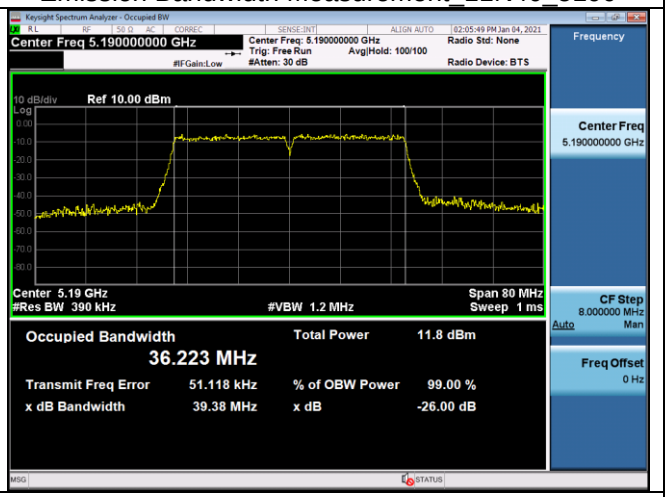
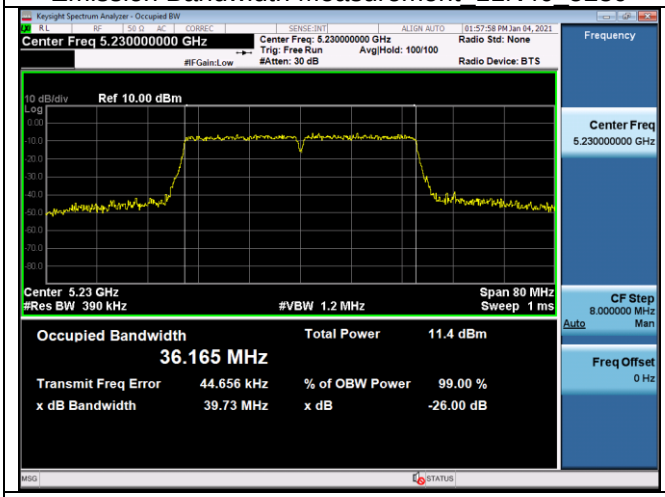
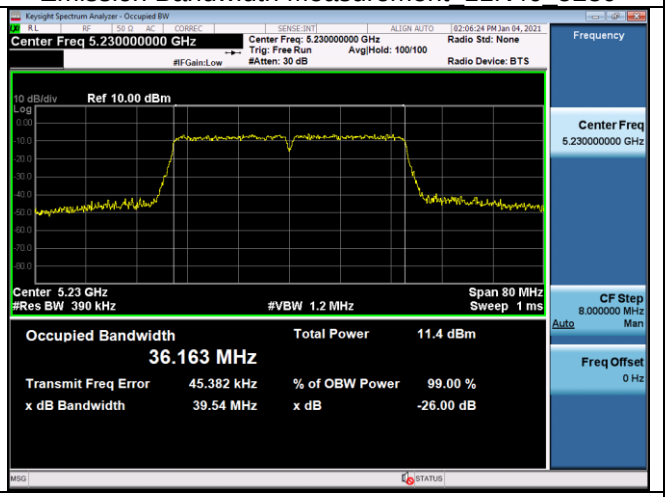


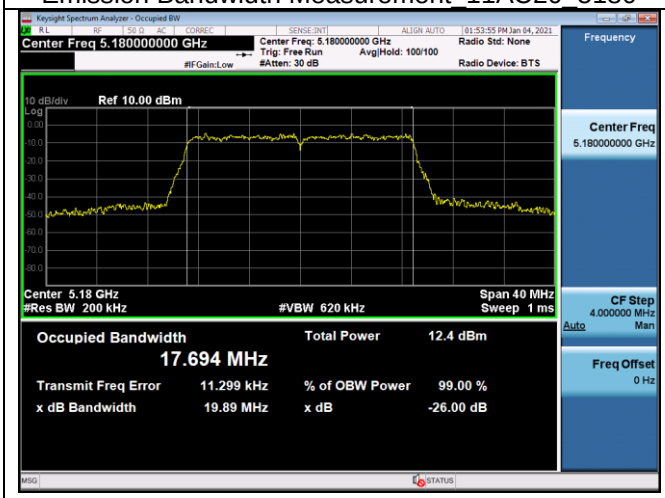
Emission Bandwidth Measurement_11N40_5230



Emission Bandwidth Measurement_11N40_5230



Emission Bandwidth Measurement_11AC20_5180

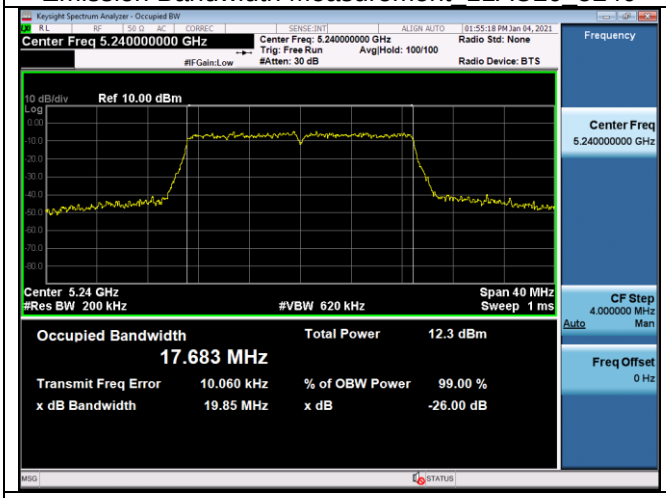


Emission Bandwidth Measurement_11AC20_5180

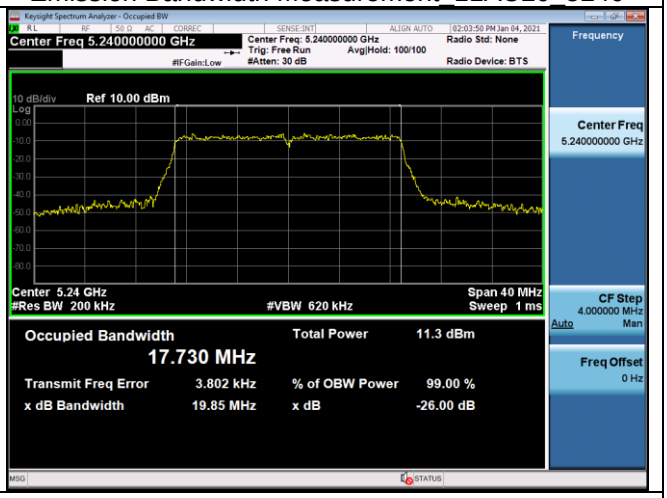
Emission Bandwidth Measurement_11AC20_5200

Emission Bandwidth Measurement_11AC20_5200

Emission Bandwidth Measurement_11AC20_5240

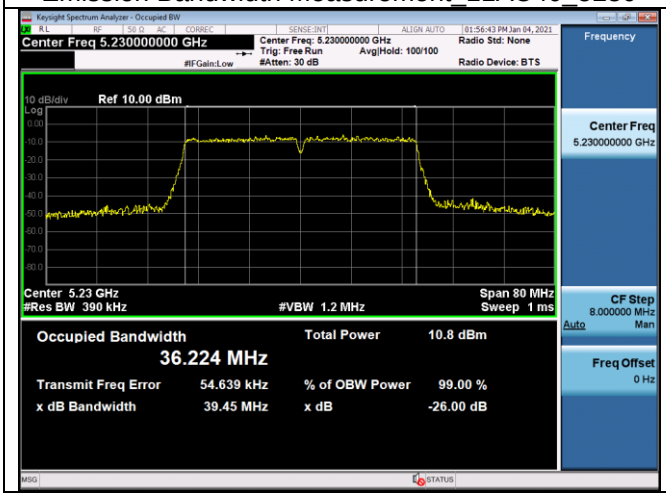


Emission Bandwidth Measurement_11AC20_5240

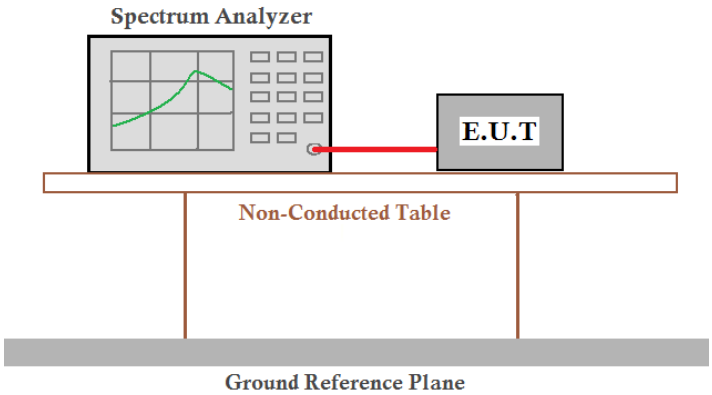


Emission Bandwidth Measurement_11AC40_5190

Emission Bandwidth Measurement_11AC40_5190

Emission Bandwidth Measurement_11AC40_5230	Emission Bandwidth Measurement_11AC40_5230
	

5.4 Power Spectral Density

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)	
Test Method:	KDB 789033 D02 v02r01 Section F	
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss in the spectrum analyzer.*	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates	
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a ; 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps of rate is the worst case of 802.11n(40MHz); 6.5Mbps of rate is the worst case of 802.11ac(20MHz) ; 13.5Mbps of rate is the worst case of 802.11ac(40MHz);	
Limit:	U-NII-1	11dBm/MHz
Test Results:	Pass	

Measurement Data

For U-NII-1 Band:

Test Mode	Test Channel	Meas PSD [dBm/MHz]		Duty Cycle Factor [dB]	PSD [dBm/MHz]		Limit [dBm/MHz]	Verdict
		ANT1	ANT2		ANT1	ANT2		
11A	5180	3.736	3.275	0	3.736	3.275	17.00	PASS
11A	5200	3.334	3.422	0	3.334	3.422	17.00	PASS
11A	5240	3.430	2.898	0	3.430	2.898	17.00	PASS
11N20	5180	2.238	2.719	0	2.238	2.719	17.00	PASS
11N20	5200	3.144	3.429	0	3.144	3.429	17.00	PASS
11N20	5240	2.566	2.589	0	2.566	2.589	17.00	PASS
11N40	5190	-1.751	-1.453	0	-1.751	-1.453	17.00	PASS
11N40	5230	-1.718	-1.026	0	-1.718	-1.026	17.00	PASS
11AC20	5180	2.896	2.587	0	2.896	2.587	17.00	PASS
11AC20	5200	2.644	2.168	0	2.644	2.168	17.00	PASS
11AC20	5240	2.852	1.569	0	2.852	1.569	17.00	PASS
11AC40	5190	-1.726	-1.239	0	-1.726	-1.239	17.00	PASS
11AC40	5230	-2.113	-1.192	0	-2.113	-1.192	17.00	PASS

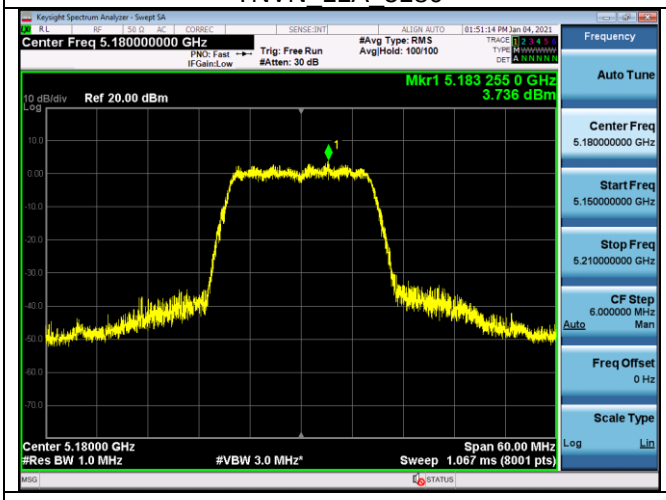
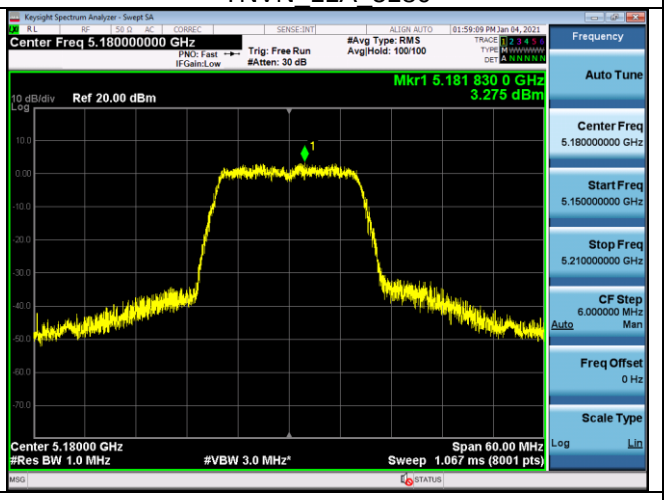
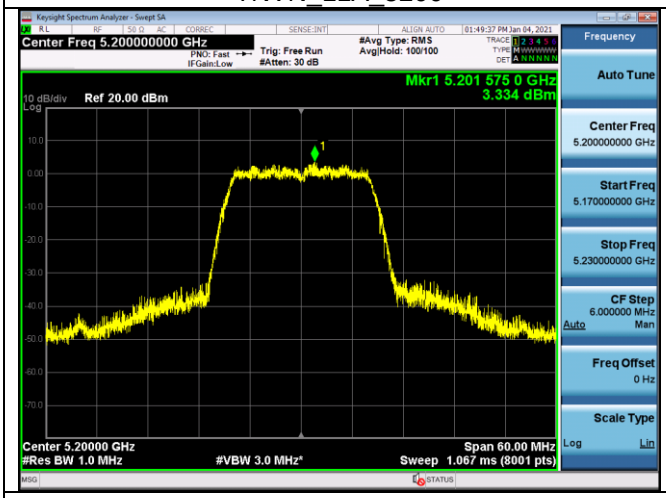
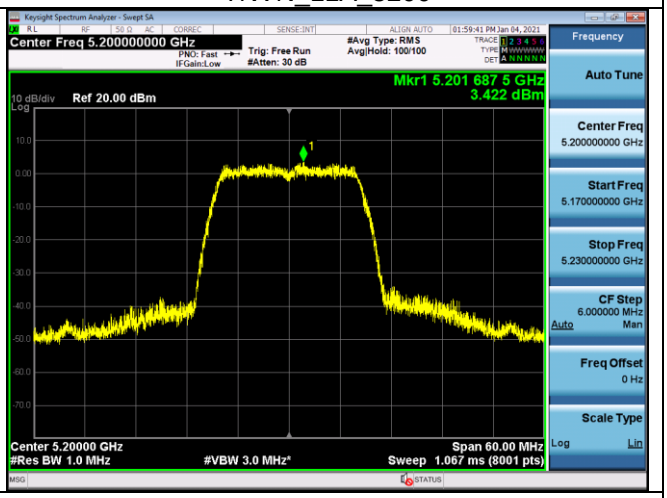
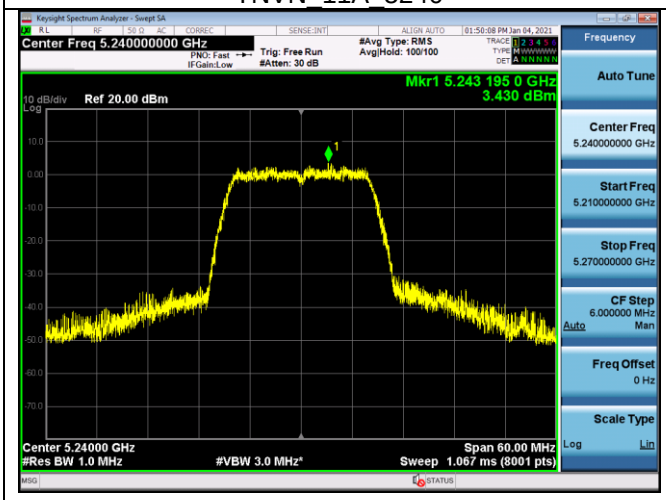
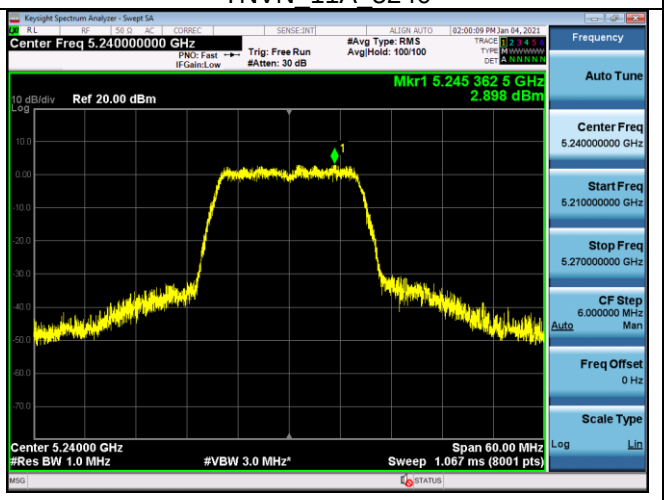
Remark:

PSD = Meas PSD + Duty Cycle Factor

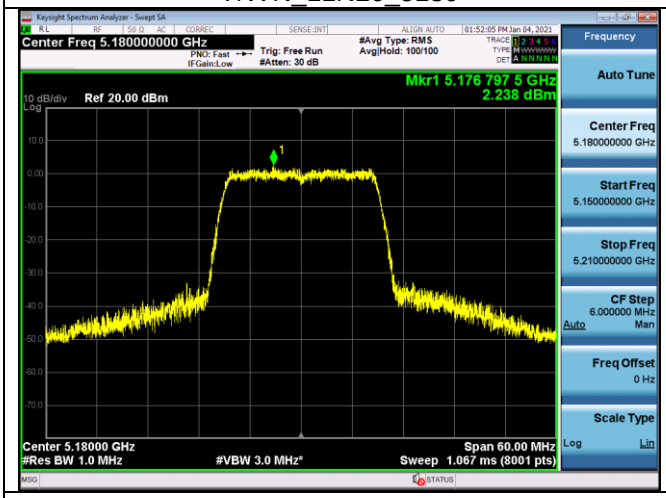
ANT1:Duty Cycle Factor=0

ANT2:Duty Cycle Factor=0

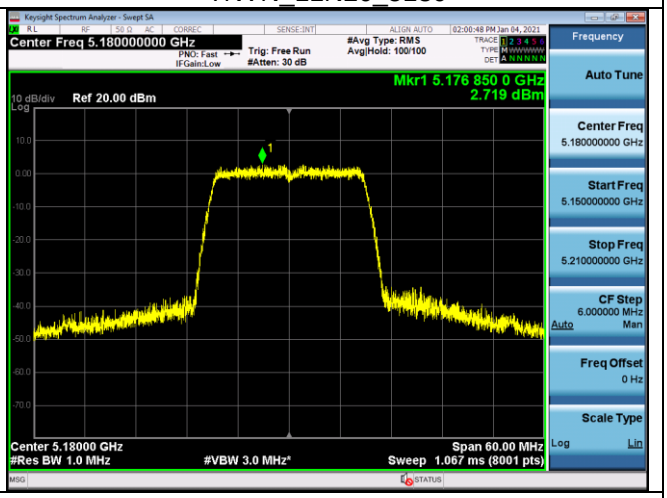
Test plot as follows:

ANT1	ANT2
TNVN_11A_5180	TNVN_11A_5180
	
TNVN_11A_5200	TNVN_11A_5200
	
TNVN_11A_5240	TNVN_11A_5240
	

TNVN_11N20_5180



TNVN_11N20_5180



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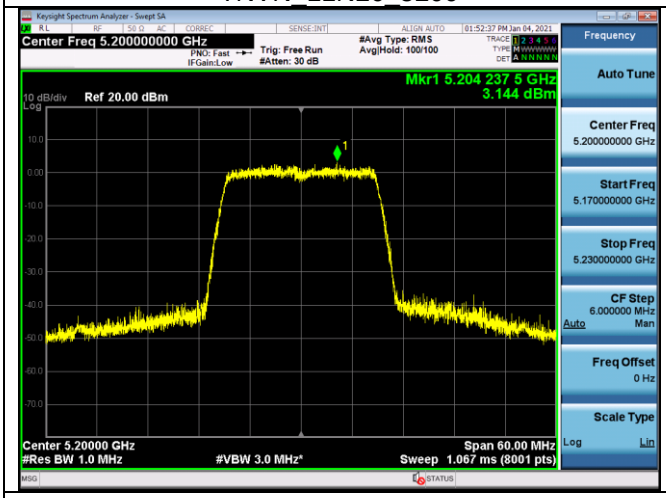
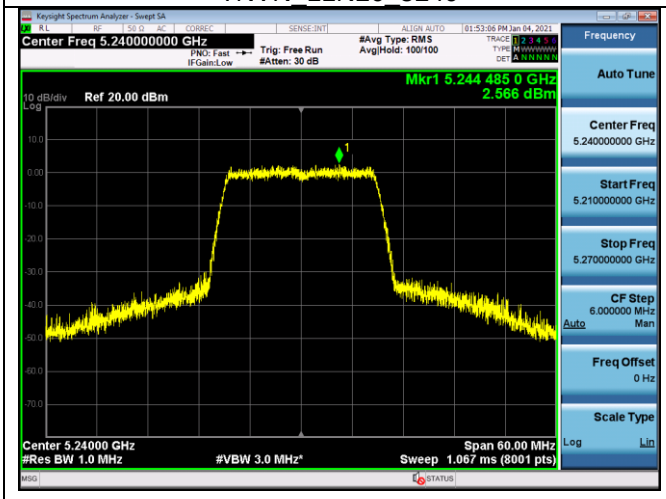
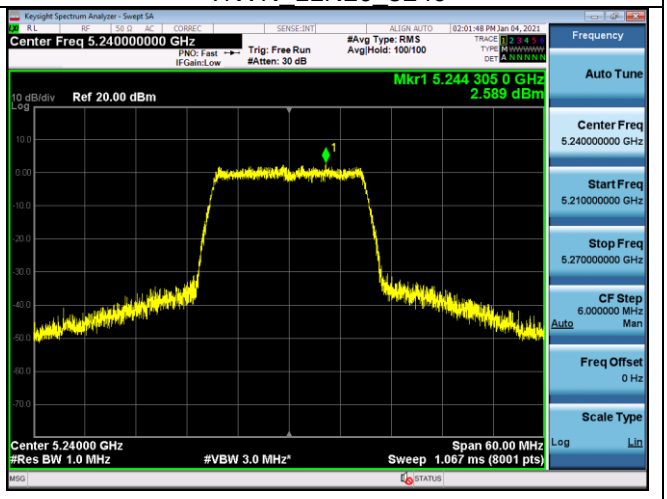


TNVN_11N20_5200

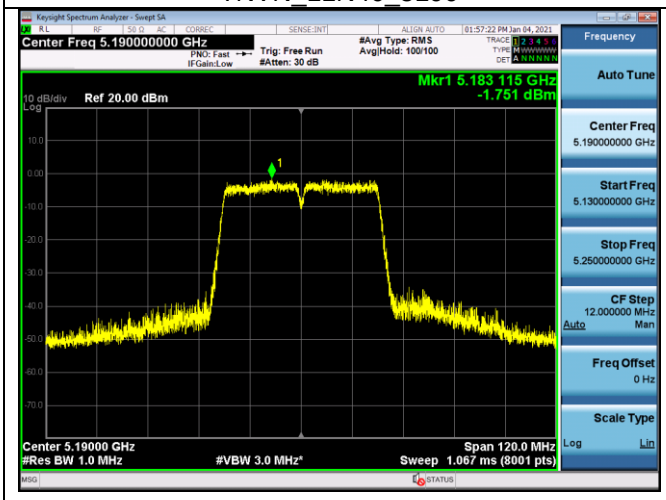
TNVN_11N20_5240



TNVN_11N20_5240

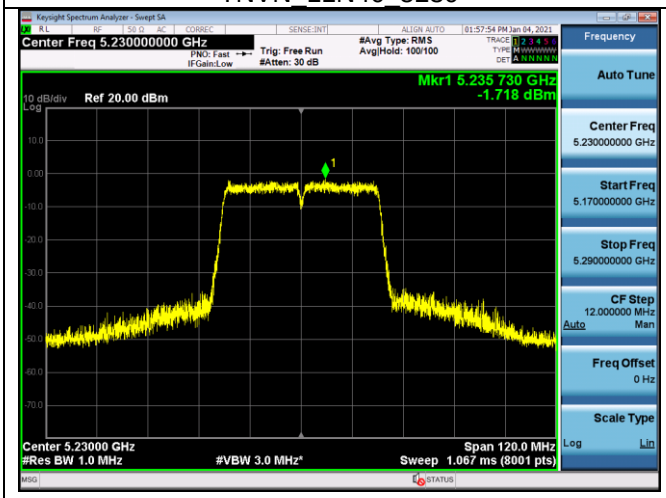


TNVN_11N40_5190

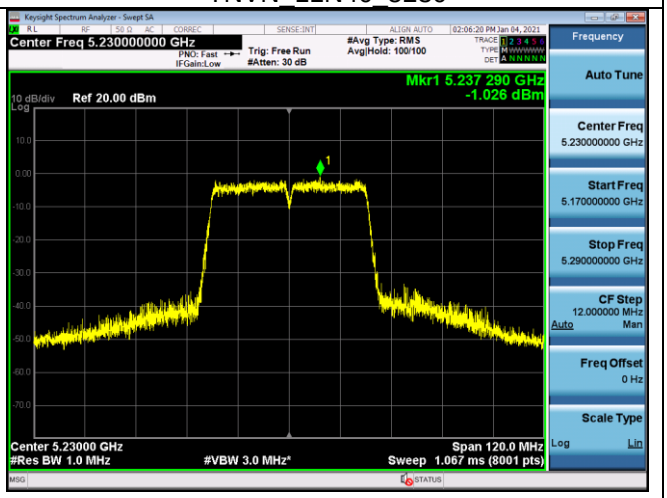


TNVN_11N40_5190

TNVN_11N40_5230



TNVN_11N40_5230



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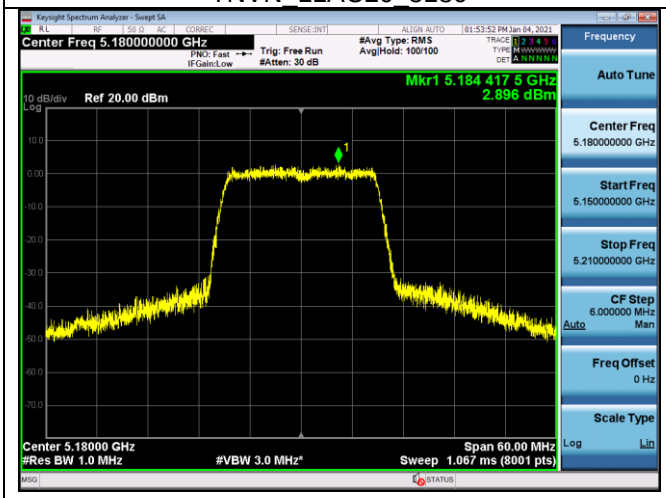

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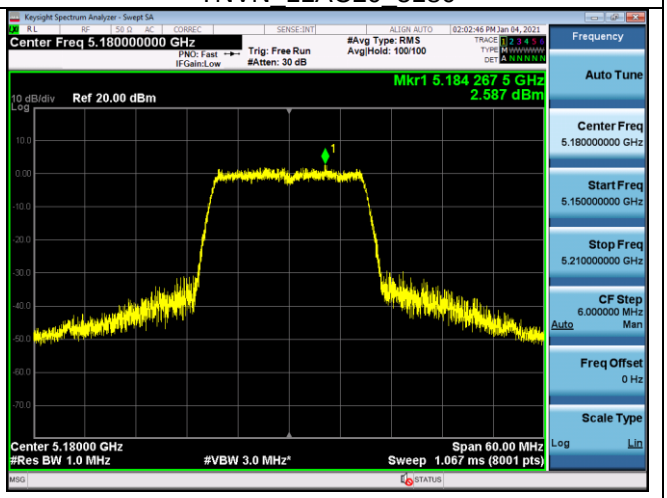

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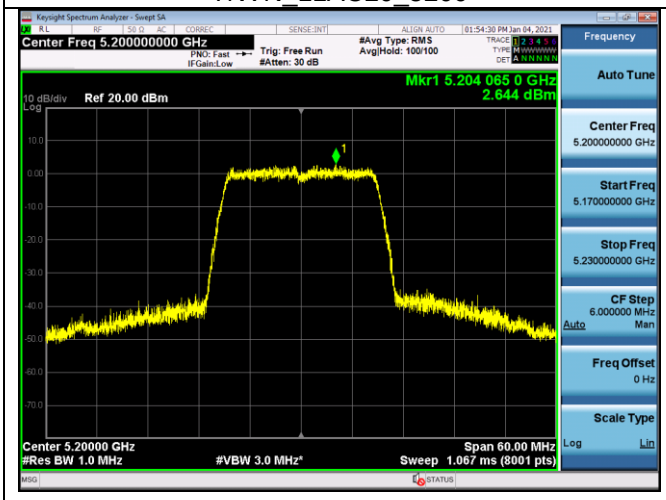

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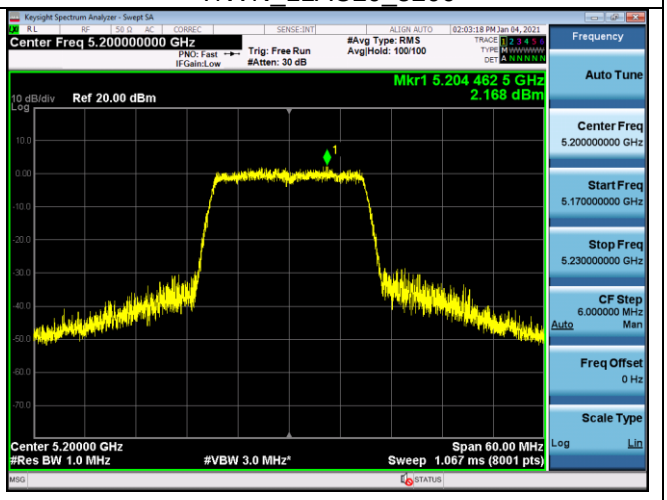

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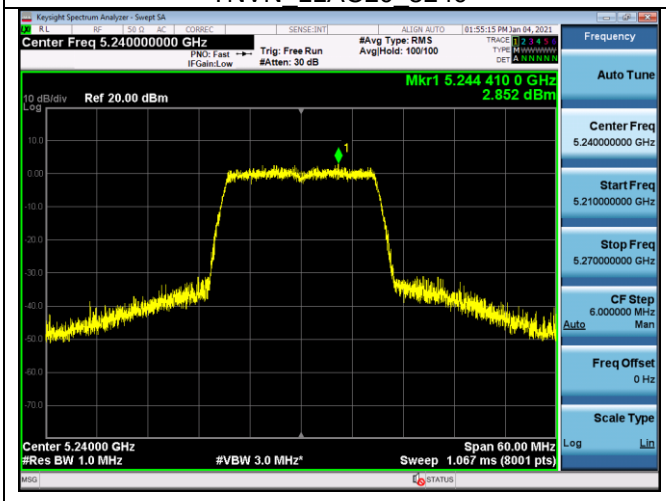

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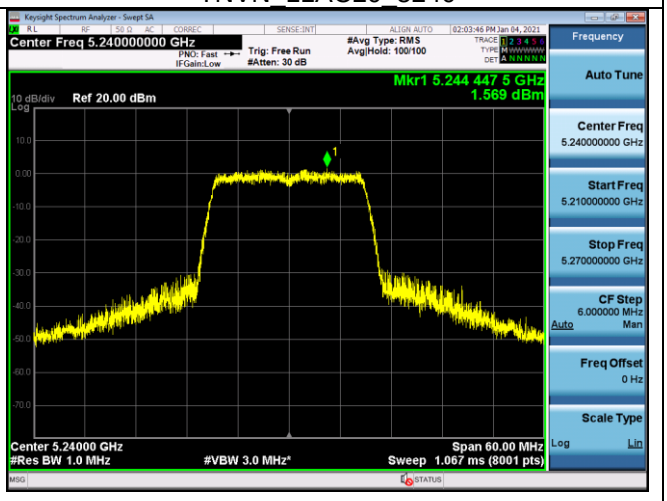

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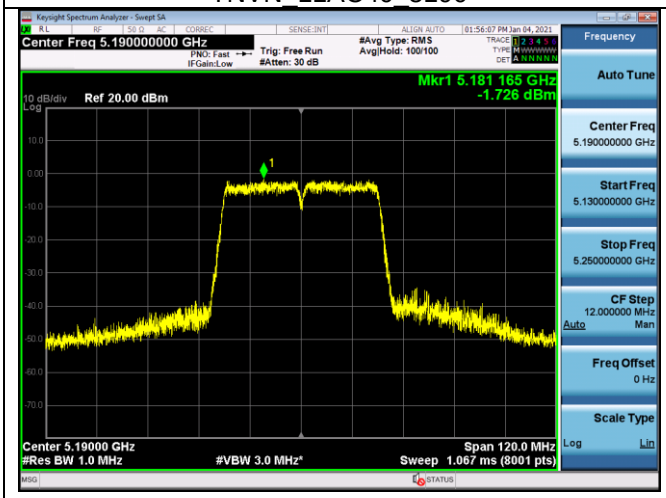
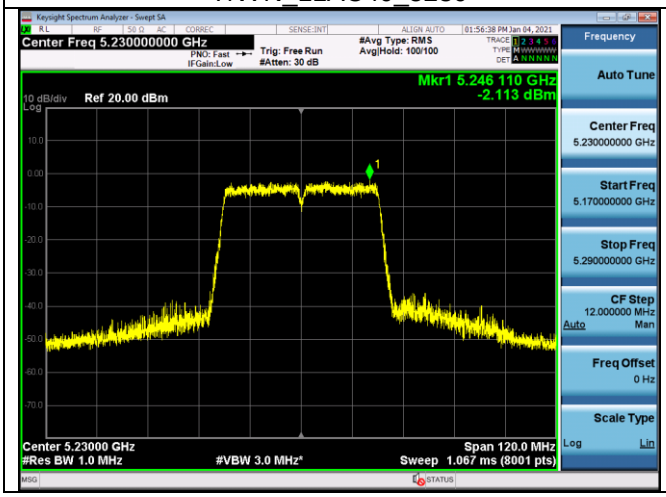


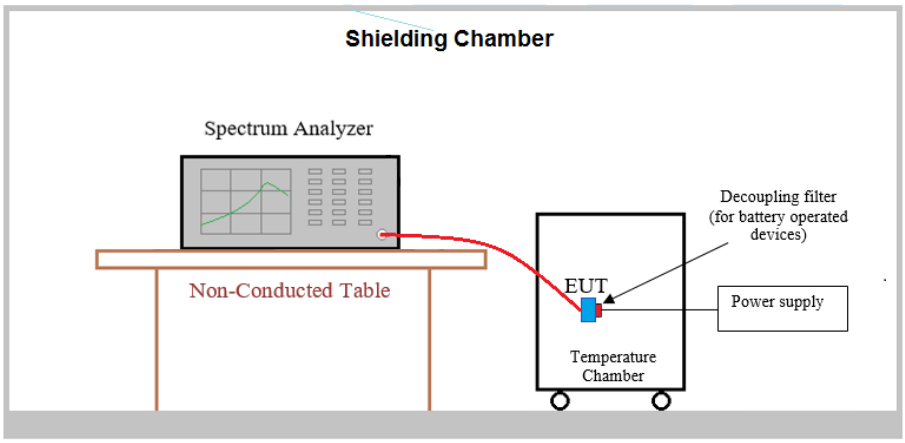
TNVN_11AC40_5190

TNVN_11AC40_5230	TNVN_11AC40_5230
	

Summed MIMO/CDD Power Spectral Density Measurements

Test Mode	Test Channel	Meas PSD [dBm/MHz]		MIMO/CDD Power Density [dBm/MHz]	Limit [dBm/MHz]	Verdict
		ANT1	ANT2			
11N20	5180	2.238	2.719	5.495	16.99	PASS
11N20	5200	3.144	3.429	6.299	16.99	PASS
11N20	5240	2.566	2.589	5.588	16.99	PASS
11N40	5190	-1.751	-1.453	1.411	16.99	PASS
11N40	5230	-1.718	-1.026	1.652	16.99	PASS
11AC20	5180	2.896	2.587	5.755	16.99	PASS
11AC20	5200	2.644	2.168	5.423	16.99	PASS
11AC20	5240	2.852	1.569	5.268	16.99	PASS
11AC40	5190	-1.726	-1.239	1.535	16.99	PASS
11AC40	5230	-2.113	-1.192	1.382	16.99	PASS

5.5 Frequency Stability

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (g)
Test Method:	ANSI C63.10-2013
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss in the spectrum analyzer.*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6Mbps of rate is the worst case of 802.11a ; 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps of rate is the worst case of 802.11n(40MHz); 6.5Mbps of rate is the worst case of 802.11ac(20MHz) ; 13.5Mbps of rate is the worst case of 802.11ac(40MHz); Only the worst case is recorded in the report.
Limit:	The frequency of the carrier signal shall be maintained within band of operation.
Test Results:	Pass

Measurement Data

802.11a20--5180 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5180.012	2.258
40		5180.011	2.027
30		5180.034	6.598
20		5180.009	1.729
10		5180.037	7.127
0		5180.015	2.969
-10		5180.037	7.223
-20		5180.017	3.292

802.11a20--5200 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5200.016	3.096
40		5200.019	3.676
30		5200.033	6.392
20		5200.014	2.636
10		5200.008	1.568
0		5200.006	1.224
-10		5200.007	1.358
-20		5200.037	7.111

802.11a20-- 5240 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.003	0.658
40		5240.014	2.741
30		5240.012	2.244
20		5240.026	4.996
10		5200.033	6.385
0		5240.036	6.848
-10		5240.027	5.171
-20		5240.015	2.825

802.11n20--5180 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5180.019	3.641
40		5180.018	3.544
30		5180.036	7.018
20		5180.008	1.576
10		5180.010	1.923
0		5180.001	0.268
-10		5180.027	5.211
-20		5180.010	1.966

802.11n20--5200 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5200.034	6.527
40		5200.010	1.859
30		5200.018	3.515
20		5200.006	1.235
10		5200.010	1.918
0		5200.010	1.918
-10		5200.012	2.217
-20		5200.030	5.776

802.11n20-- 5240 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.031	5.888
40		5240.025	4.839
30		5240.003	0.565
20		5240.019	3.620
10		5240.028	5.367
0		5240.007	1.266
-10		5240.016	2.971
-20		5240.018	3.400

802.11n40 -- 5190 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5190.026	5.024
40		5190.019	3.584
30		5190.008	1.460
20		5190.024	4.700
10		5190.025	4.773
0		5190.018	3.561
-10		5190.016	3.060
-20		5190.003	0.558

802.11n40 -- 5230 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5230.026	4.915
40		5230.008	1.509
30		5230.005	0.914
20		5230.032	6.107
10		5230.038	7.218
0		5230.036	6.795
-10		5230.010	1.937
-20		5230.035	6.677

802.11ac20--5180 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5180.027	5.302
40		5180.012	2.363
30		5180.031	6.074
20		5180.001	0.195
10		5180.012	2.326
0		5180.015	2.824
-10		5180.037	7.087
-20		5180.002	0.301

802.11ac20--5200 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5200.017	3.302
40		5200.009	1.646
30		5200.007	1.265
20		5200.020	3.920
10		5200.000	0.000
0		5200.027	5.238
-10		5200.020	3.927
-20		5200.002	0.363

802.11ac20-- 5240 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.007	1.296
40		5240.010	1.855
30		5240.035	6.659
20		5240.008	1.578
10		5240.015	2.950
0		5240.018	3.509
-10		5240.026	4.986
-20		5240.034	6.559

802.11ac40 -- 5190 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5190.027	5.134
40		5190.007	1.305
30		5190.018	3.513
20		5190.009	1.700
10		5190.007	1.256
0		5190.009	1.700
-10		5190.012	2.306
-20		5190.010	1.891

802.11ac40 -- 5230 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5230.032	6.096
40		5230.038	7.265
30		5230.012	2.287
20		5230.029	5.615
10		5230.003	0.636
0		5230.032	6.159
-10		5230.012	2.300
-20		5230.018	3.390

5.6 Radiated Spurious Emissions

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6) FCC 47 CFR Part 15 Subpart C Section 15.209/205
Test Method:	KDB 789033 D02 v02r01 Section G.3, G.4, G.5, and G.6
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Receiver Setup:	

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

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

Test Setup:	

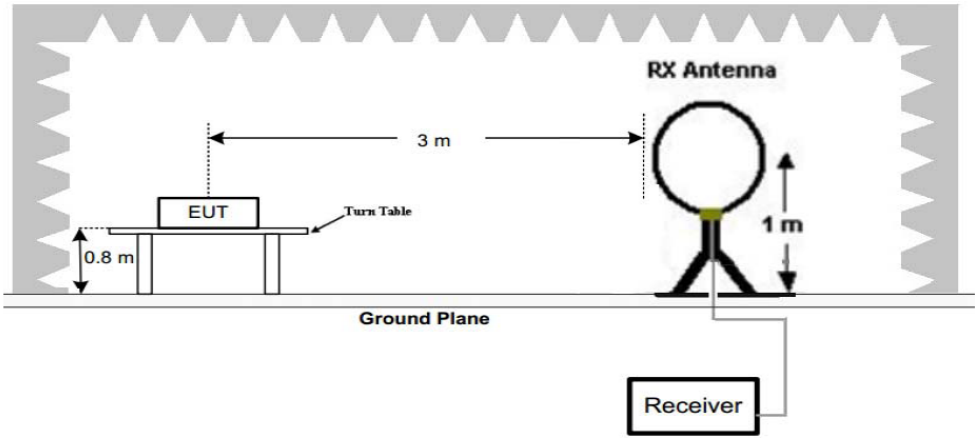


Figure 1. Below 30MHz

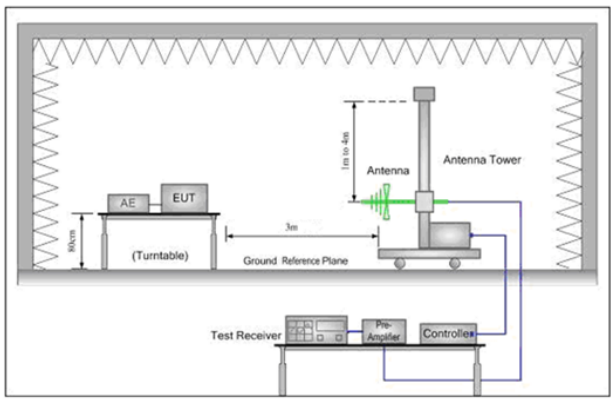


Figure 2. 30MHz to 1GHz

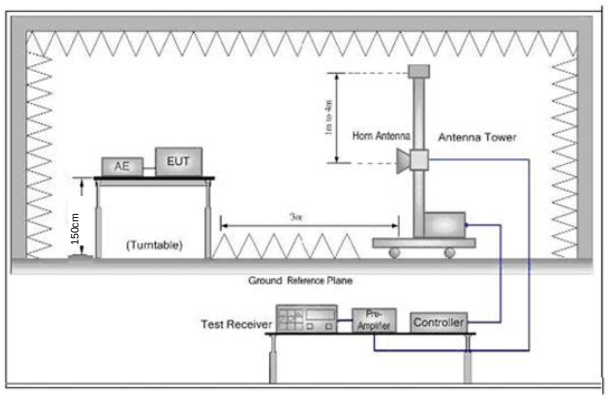


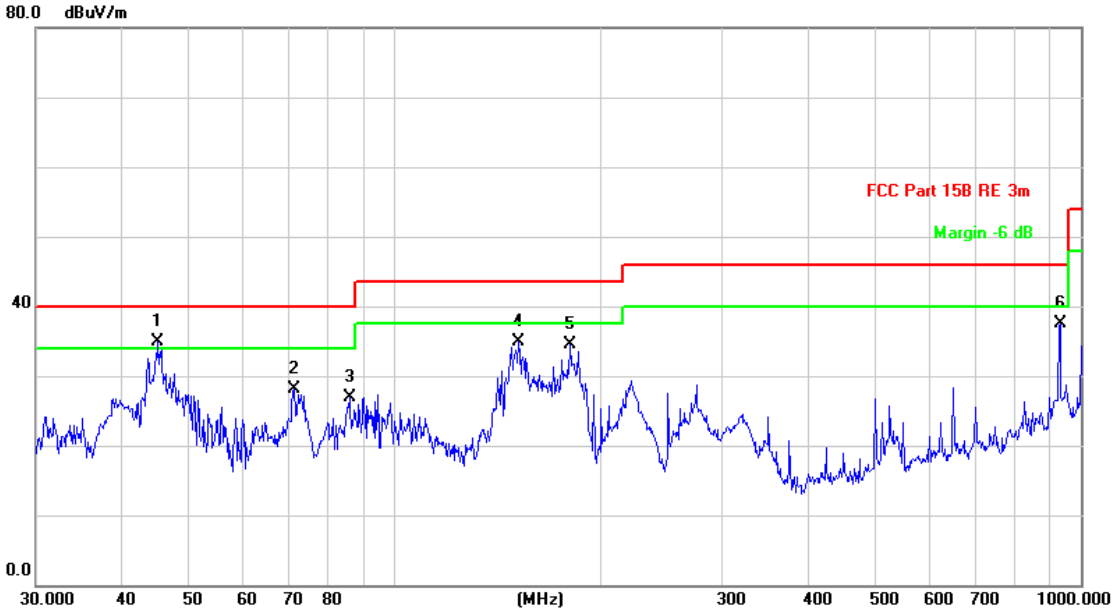
Figure 3. Above 1 GHz

Test Procedure:	a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. Note: For the radiated emission test above 1GHz: Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. 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. d. 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(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps of rate is the worst case of 802.11n(40MHz); 6.5Mbps of rate is the worst case of 802.11ac(20MHz) ; 13.5Mbps of rate is the worst case of 802.11ac(40MHz); Only the worst case is recorded in the report.
Test Results:	Pass

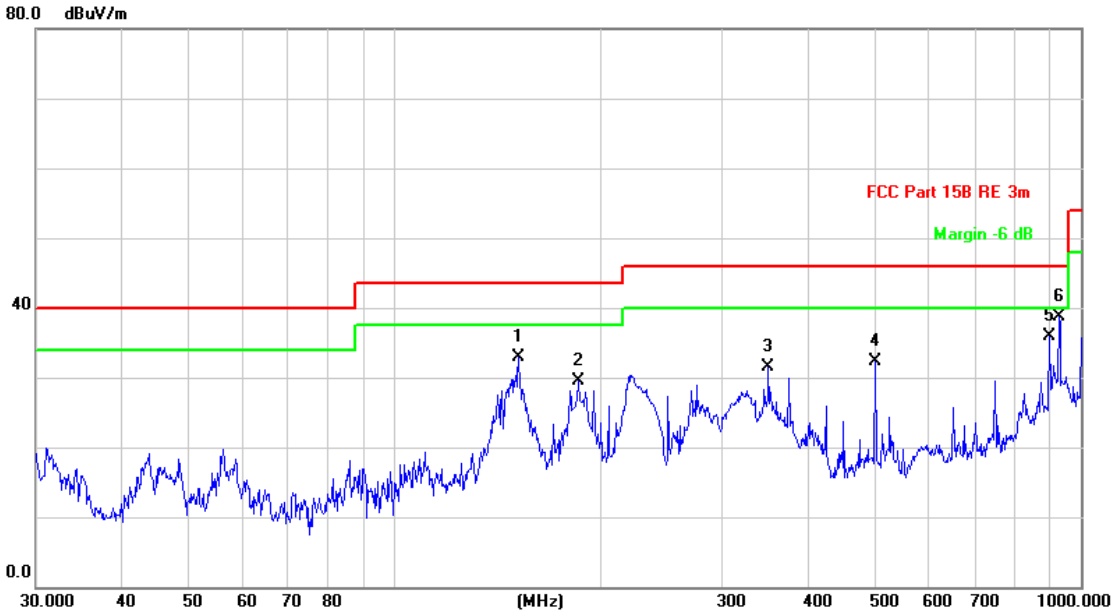
5.6.1 Radiated emission below 1GHz

30MHz~1GHz		
Test mode:	Transmitting	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	45.2165	51.28	-16.33	34.95	40.00	-5.05	QP			
2		71.3298	46.96	-18.87	28.09	40.00	-11.91	QP			
3		85.8983	45.06	-18.17	26.89	40.00	-13.11	QP			
4		151.5971	47.77	-12.78	34.99	43.50	-8.51	QP			
5		180.0165	48.79	-14.31	34.48	43.50	-9.02	QP			
6		932.2713	37.47	0.11	37.58	46.00	-8.42	QP			

Test mode:	Transmitting	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		151.5972	45.96	-13.05	32.91	43.50	-10.59	QP			
2		185.1379	44.04	-14.48	29.56	43.50	-13.94	QP			
3		350.4768	41.22	-9.81	31.41	46.00	-14.59	QP			
4		501.1790	38.53	-6.29	32.24	46.00	-13.76	QP			
5		900.1474	35.65	0.18	35.83	46.00	-10.17	QP			
6	*	929.0082	38.03	0.58	38.61	46.00	-7.39	QP			