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Report Template Version: V04
Report Template Revision Date: 2018-07-06

Test Report

Report No. :	CQASZ20210300017EX-02
Applicant:	KMJ Group Inc
Address of Applicant:	2221 W Custer Pl, Denver, CO 80223
Manufacturer:	KMJ Group Inc
Address of Manufacturer:	2221 W Custer Pl, Denver, CO 80223
Equipment Under Test (EUT):	
Product:	KMJ U-series Mini Box PC
All Model No.:	MUCBOX-THE8, MUCBOX -G7, MUCBOX -G6, MUCBOX-GS, MUCBOX-LS
Test Model No.:	MUCBOX-THE8
Brand Name:	KMJ
FCC ID:	2AZFV-KMJ-MN-UBX
Standards:	47 CFR FCC Part 15 Subpart E 15.247
Date of Test:	Mar. 12, 2021 – Mar. 27, 2021
Date of Issue:	Mar. 27, 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
CQASZ20210300017EX-02	Rev.01	Initial report	Mar. 27, 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	PASS
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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General Information

4.1 Client Information

Applicant:	KMJ Group Inc
Address of Applicant:	2221 W Custer Pl, Denver, CO 80223
Manufacturer:	KMJ Group Inc
Address of Manufacturer:	2221 W Custer Pl, Denver, CO 80223

4.2 General Description of EUT

Product Name:	KMJ U-series Mini Box PC
Test Model No.:	MUCBOX-THE8
Trade Mark:	KMJ
Hardware Version:	KUB-868-V3
Software Version:	/
Operation Frequency:	5180 ~ 5240 MHz, 5745 ~ 5825 MHz
Channel Numbers:	5180 ~ 5240 MHz: 4 for 802.11n, 802.11ac 2 for 802.11n40 , 802.11ac 40 5745 ~ 5825 MHz: 5 for, 802.11n , 802.11ac 2 for 802.11n40, 802.11ac40
Type of Modulation:	IEEE 802.11n/IEEE 802.11ac: OFDM
Product Type:	☐ Mobile ☐ Portable ☒ Fix Location
Antenna Type:	integral antenna
Antenna Gain:	3dBi Max
Power Supply:	DC 5V from adapter
Adapter Information:	AC/DC ADAPTER MODEL: GA0501500 INPUT:110-240V AC 50/60Hz 0.6A OUTPUT: DC 5V 1500mA

Note: 1. This report is only for 5GHz WiFi.

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

Operation Frequency Each of Channel							
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
For IEEE 802.11n-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-HT20/ac-VHT20 operation in the 5725 MHz to 5850 MHz band							
149	5745 MHz	153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--	--	--
For IEEE 802.11n-HT40/ac-VHT40 operation in the 5150 MHz to 5250 MHz band							
38	5190 MHz	46	5230 MHz	--	--	--	--

For IEEE 802.11n-HT40/ac-VHT40 operation in the 5725 MHz to 5850 MHz band							
151	5755 MHz	159	5795 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 802.11n-20 IEEE 802.11ac20	5150 MHz to 5250 MHz	Channel 36	Channel 40	Channel 48
		5180 MHz	5200 MHz	5240 MHz
	5725 MHz to 5850 MHz	Channel 149	Channel 157	Channel 165
		5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n-40 IEEE 802.11ac-40	5150 MHz to 5250 MHz	Channel 38	--	Channel 46
		5190 MHz	--	5230 MHz
	5725 MHz to 5850 MHz	Channel 151	--	Channel 159
		5755 MHz	--	5795 MHz

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

Worst Case Configuration: transmitting both 2.4GHz mode and 5GHz mode

Description	2.4 GHz Emission	5 GHz Emission
Antenna	ANT1	ANT1
Channel	1	38
Operating Frequency (MHz)	2412	802.11ac-20
Data Rate (Mbps)	DSSS/1Mbps	OFDM/13.5Mbps
Mode	2.4GWIFI-802.11b	UNII-AC20

Note: The test data for the worst mode of radiation emission has been recorded in the report: CQASZ20210300017EX-01

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	
Test Condition	Temperature (°C)	Voltage (V)
TN/VN	15~ 35°C（Normal Conditions）	AC 110
TL/VL	-20	AC 100
TH/VL	50	AC 120
TL/VH	-20	AC 100
TH/VH	50	AC 120

Remark:

1)The EUT just work in such extreme temperature of -20 °C to 50 °C and the extreme voltage of AC 100 V to AC120 V, so here the EUT is tested in the temperature of -20 °C to 50 °C and the voltage of AC 100V to AC 120 V.

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.

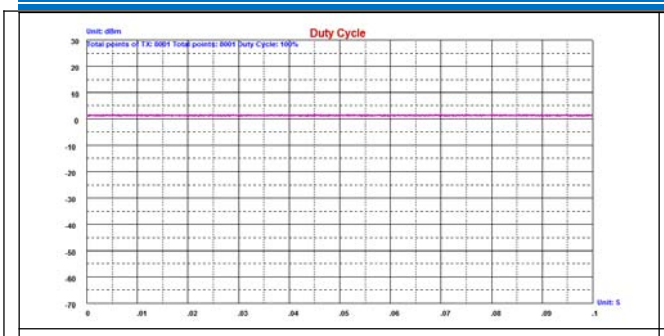
Transmitting mode

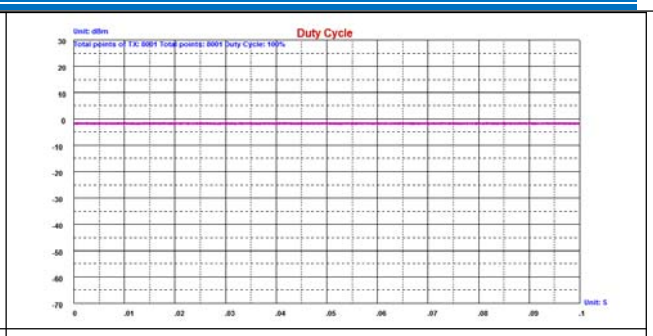
Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.

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

duty cycle eg.:

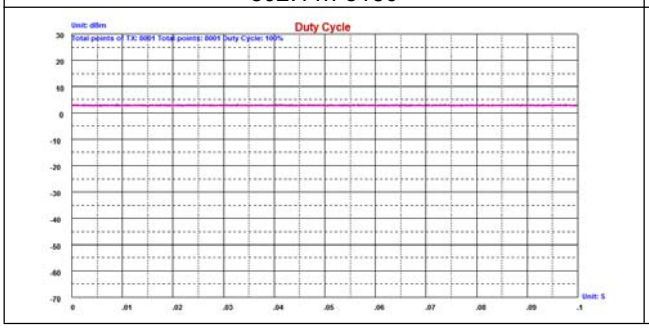
802.11ac-5180	802.11ac40 -5190

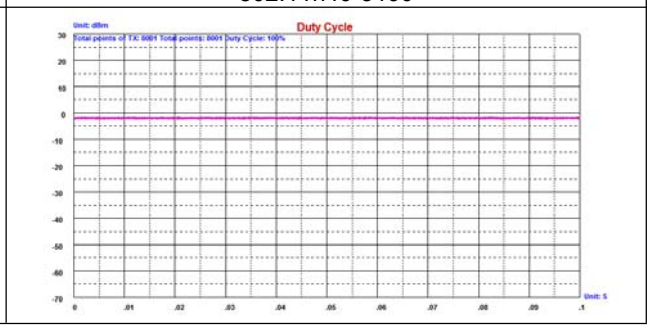




802.11n-5180

802.11n40-5190





4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	certification
AC/DC ADAPTER	/	MODEL: GA0501500 INPUT: AC 110-240V 50/60Hz 0.6A OUTPUT: DC 5V 1500mA	Provide by applicant	SDOC
/	/	/	/	/

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	FrequencError	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	2018/11/2	2019/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2018/10/28	2020/10/27
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
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
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	2021/11/1	2021/10/30
Coaxial cable	CQA	N/A	CQA-C009	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 integral antenna. The best case gain of the antenna is 3dBi.	

5.2 Conducted Emissions

Test Requirement:	47 CFR Part 15 Subpart C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	

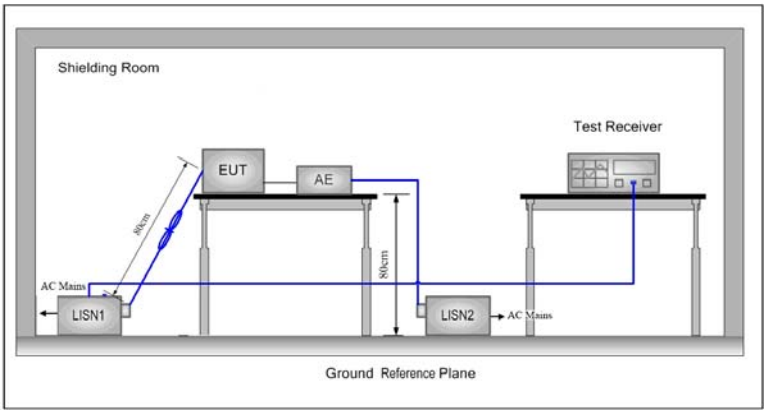
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) 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.

Test Setup:



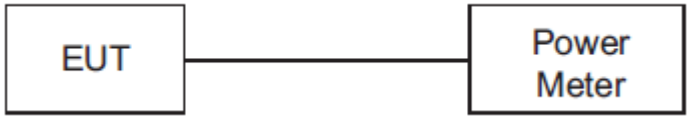
Exploratory Test Mode: Transmitting with all kind of modulations, data rates at lowest, middle and highest channel.

Final Test Mode:	All wifi modes of 5.2G/5.8G were tested at Low, Middle, and High channel; only the worst result of 802.11b CH11 was reported as below
Test Voltage:	AC110V/60Hz
Test Results:	Pass

Measurement Data

Please refer test report No.: CQASZ20210100002EX-01

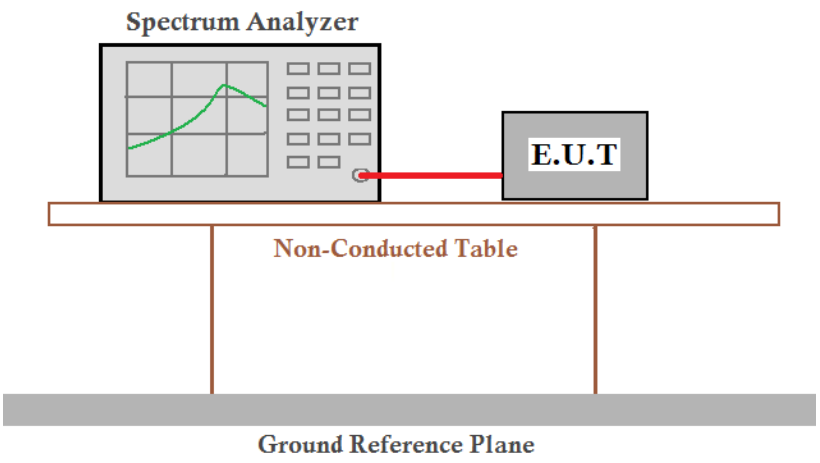
5.3 Conducted Average Output Power

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 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
	U-NII-2A	24dBm
	U-NII-2C	24dBm
	U-NII-3	30dBm
Test Results:	Pass	

Measurement Data

Test Mode	Test Channel	Level [dBm]	Duty Cycle factor (dB)	Power [dBm]	Limit [dBm]	Verdict
11N20	5180	6.00	0	6.00	24.00	PASS
11N20	5200	5.99	0	5.99	24.00	PASS
11N20	5240	5.39	0	5.39	24.00	PASS
11N20	5745	-0.36	0	-0.36	30.00	PASS
11N20	5785	-0.13	0	-0.13	30.00	PASS
11N20	5825	-0.19	0	-0.19	30.00	PASS
11N40	5190	5.14	0	5.14	24.00	PASS
11N40	5230	4.91	0	4.91	24.00	PASS
11N40	5755	-0.38	0	-0.38	30.00	PASS
11N40	5795	-0.16	0	-0.16	30.00	PASS
11AC20	5180	5.20	0	5.20	24.00	PASS
11AC20	5200	5.15	0	5.15	24.00	PASS
11AC20	5240	4.78	0	4.78	24.00	PASS
11AC20	5745	-0.36	0	-0.36	30.00	PASS
11AC20	5785	-0.14	0	-0.14	30.00	PASS
11AC20	5825	-0.22	0	-0.22	30.00	PASS
11AC40	5190	5.38	0	5.38	24.00	PASS
11AC40	5230	5.20	0	5.20	24.00	PASS
11AC40	5755	-0.23	0	-0.23	30.00	PASS
11AC40	5795	-0.29	0	-0.29	30.00	PASS

5.4 26dB Bandwidth

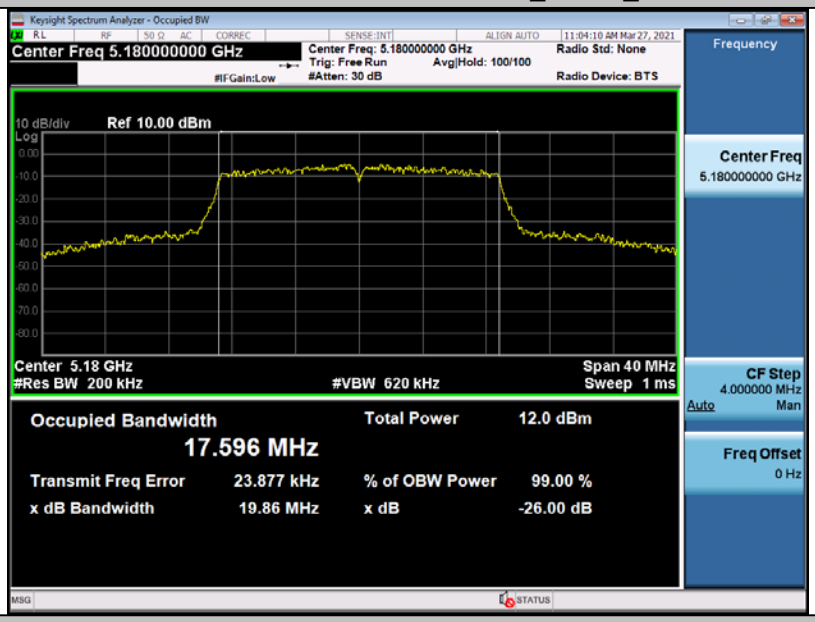
Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)
Test Method:	KDB 789033 D02 v02r01 Section C.1
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 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

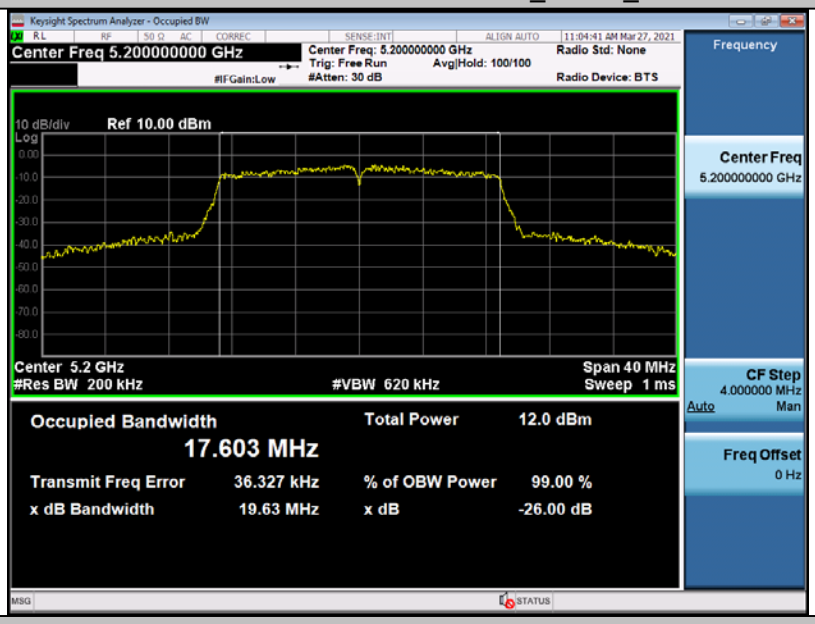
Test Mode	Test Channel	EBW[MHz]	Limit[MHz]	Verdict
11N20	5180	19.860	---	PASS
11N20	5200	19.633	---	PASS
11N20	5240	19.723	---	PASS
11N40	5190	39.309	---	PASS
11N40	5230	39.332	---	PASS
11AC20	5180	19.856	---	PASS
11AC20	5200	20.066	---	PASS
11AC20	5240	19.829	---	PASS
11AC40	5190	39.646	---	PASS
11AC40	5230	39.857	---	PASS

Test plot as follows:

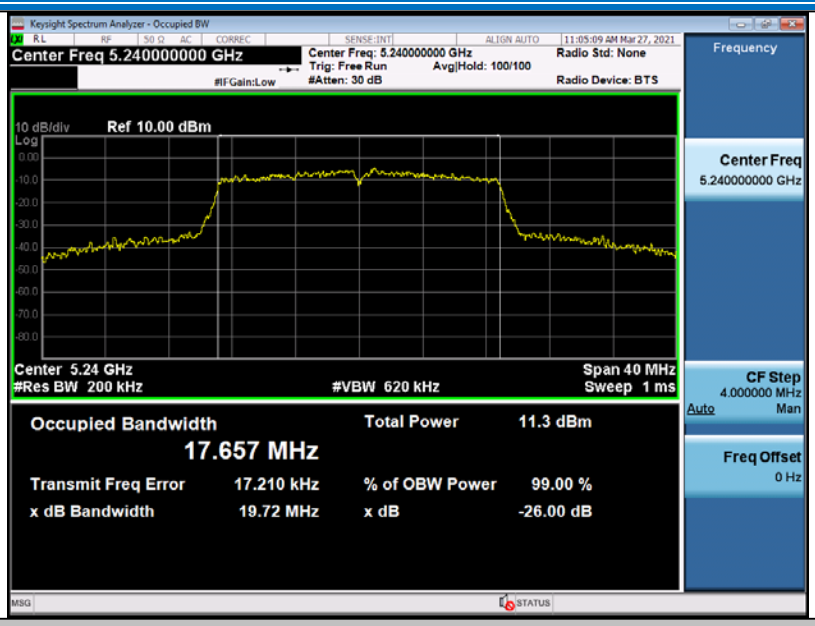
Emission Bandwidth Measurement_11N20_5180



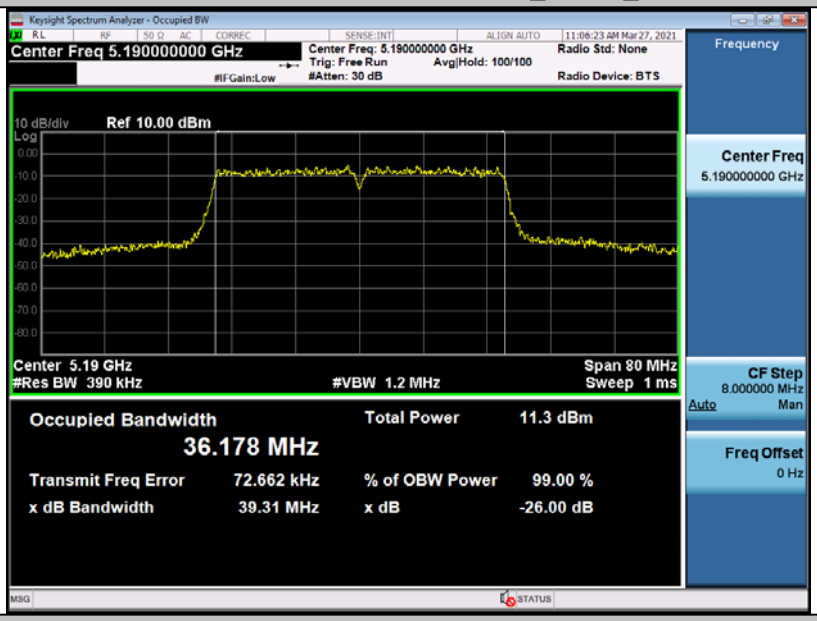
Emission Bandwidth Measurement_11N20_5200



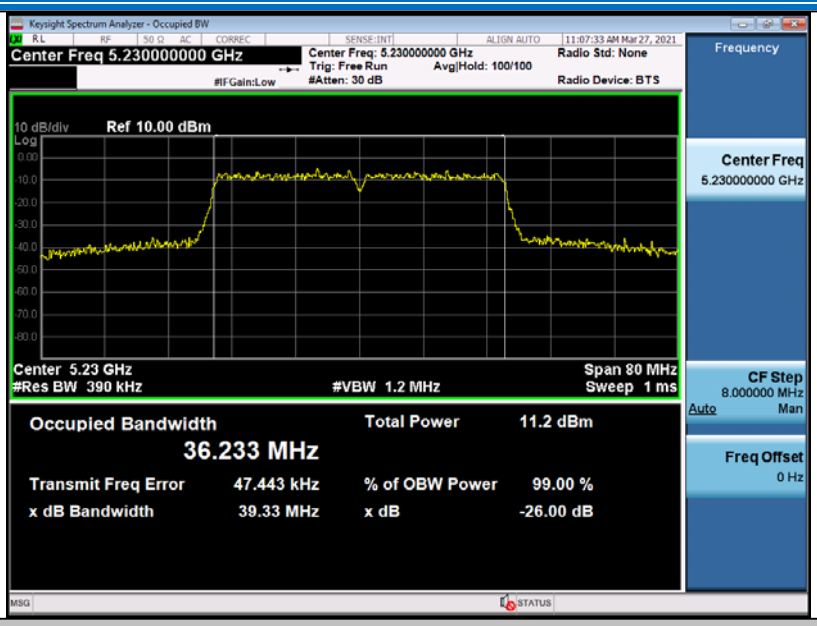
Emission Bandwidth Measurement_11N20_5240



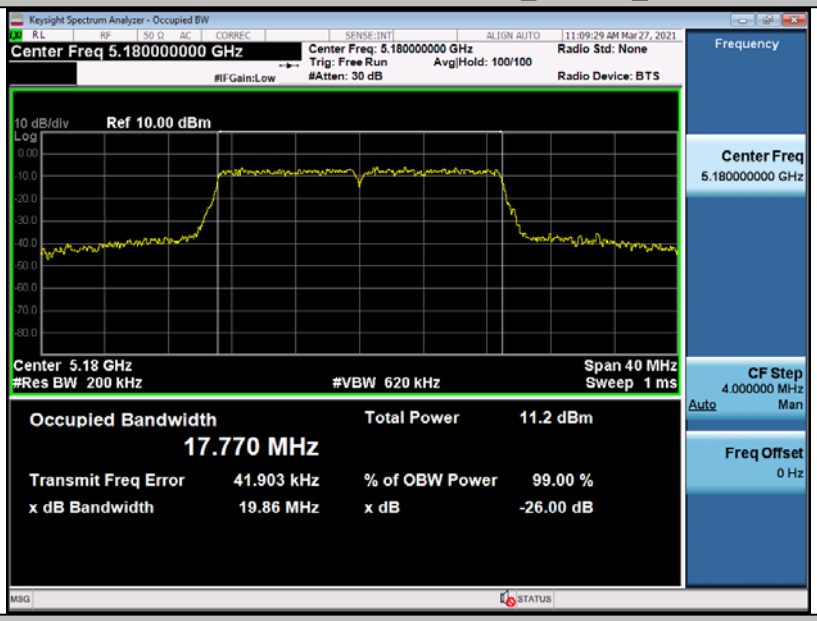
Emission Bandwidth Measurement_11N40_5190



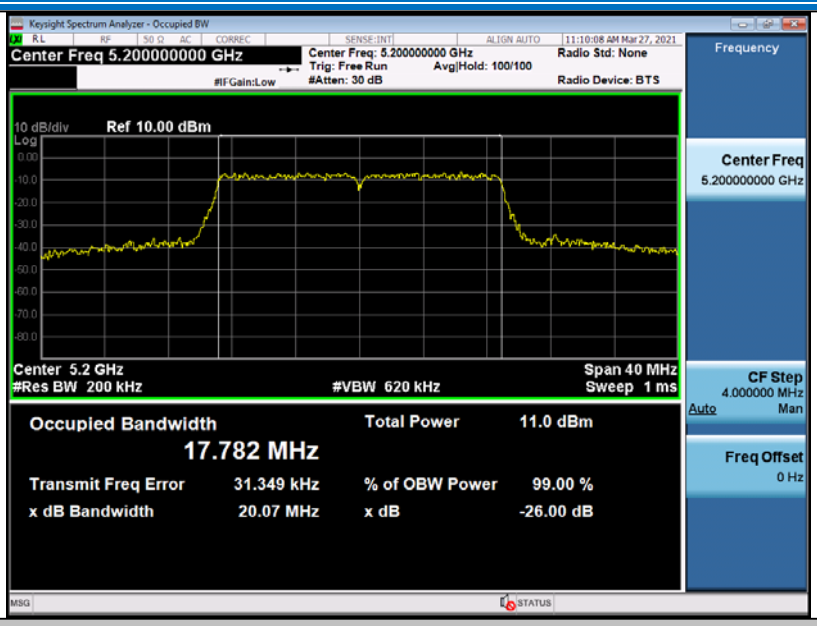
Emission Bandwidth Measurement_11N40_5230



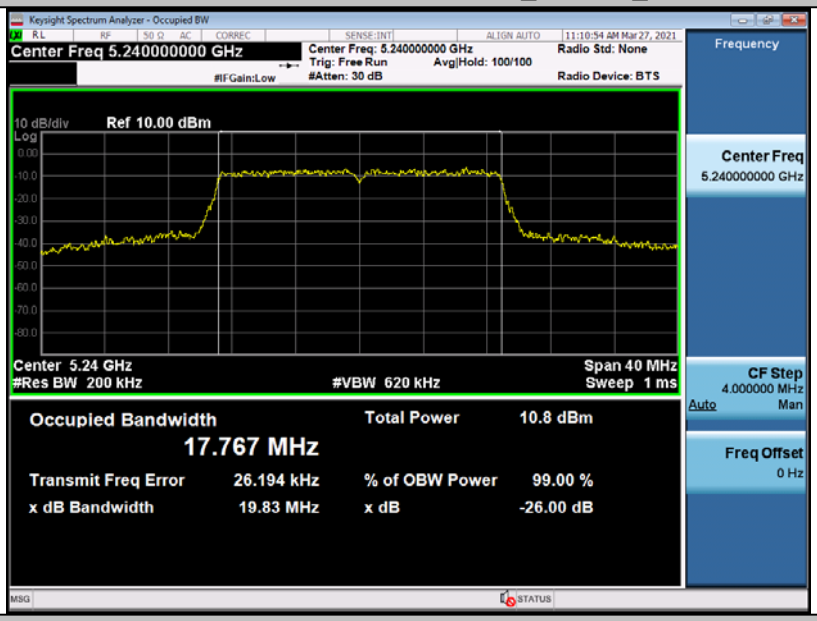
Emission Bandwidth Measurement_11AC20_5180



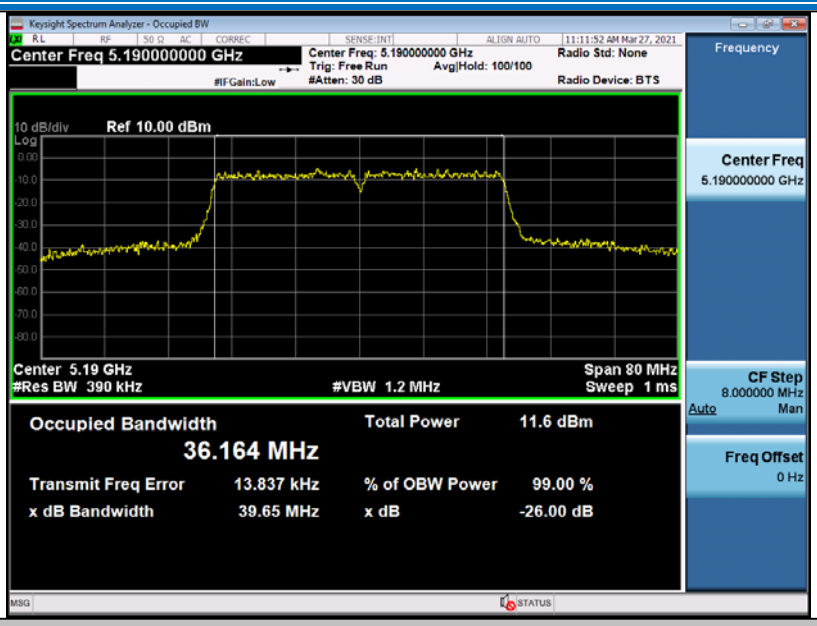
Emission Bandwidth Measurement_11AC20_5200



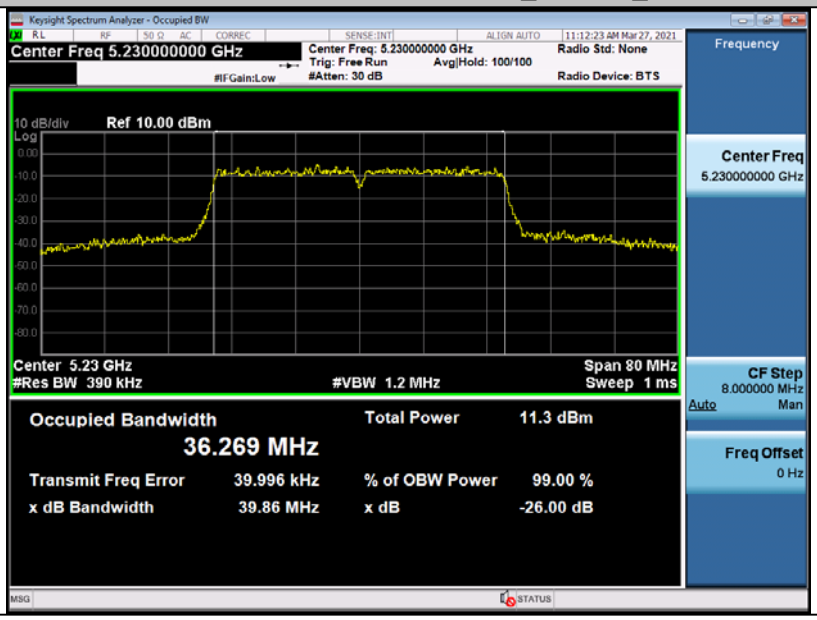
Emission Bandwidth Measurement_11AC20_5240



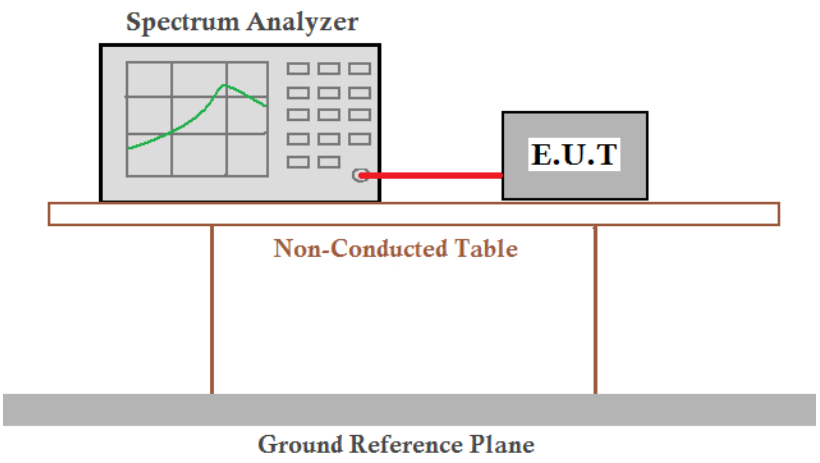
Emission Bandwidth Measurement_11AC40_5190



Emission Bandwidth Measurement_11AC40_5230



5.5 6dB Bandwidth

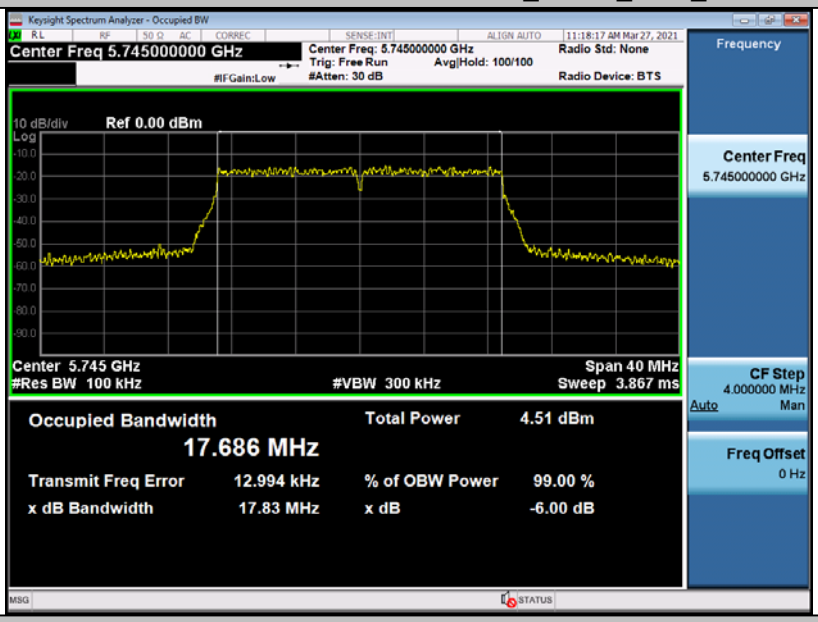
Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.407 (e)
Test Method:	KDB 789033 D02 v02r01Section C.2
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 6.5Mbps of rate is the worst case of 802.11n(20MHz) ; 13.5Mbps 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:	≥ 500 kHz
Test Results:	Pass

Measurement Data

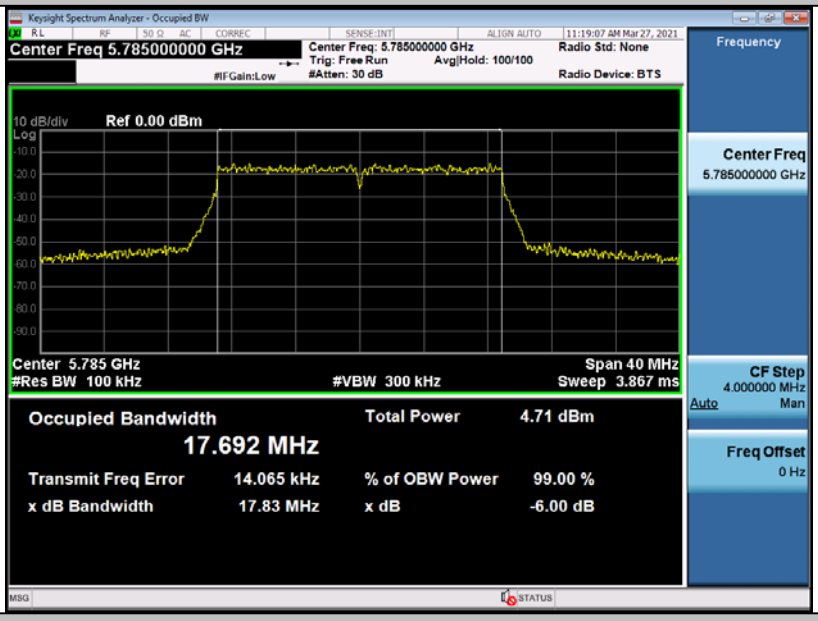
Test Mode	Test Channel	Ant	EBW[MHz]	Limit[MHz]	Verdict
11N20	5745	Ant1	17.831	0.5	PASS
11N20	5785	Ant1	17.831	0.5	PASS
11N20	5825	Ant1	17.837	0.5	PASS
11N40	5755	Ant1	36.535	0.5	PASS
11N40	5795	Ant1	36.457	0.5	PASS
11AC20	5745	Ant1	17.817	0.5	PASS
11AC20	5785	Ant1	17.816	0.5	PASS
11AC20	5825	Ant1	17.817	0.5	PASS
11AC40	5755	Ant1	36.503	0.5	PASS
11AC40	5795	Ant1	36.527	0.5	PASS

Test plot as follows:

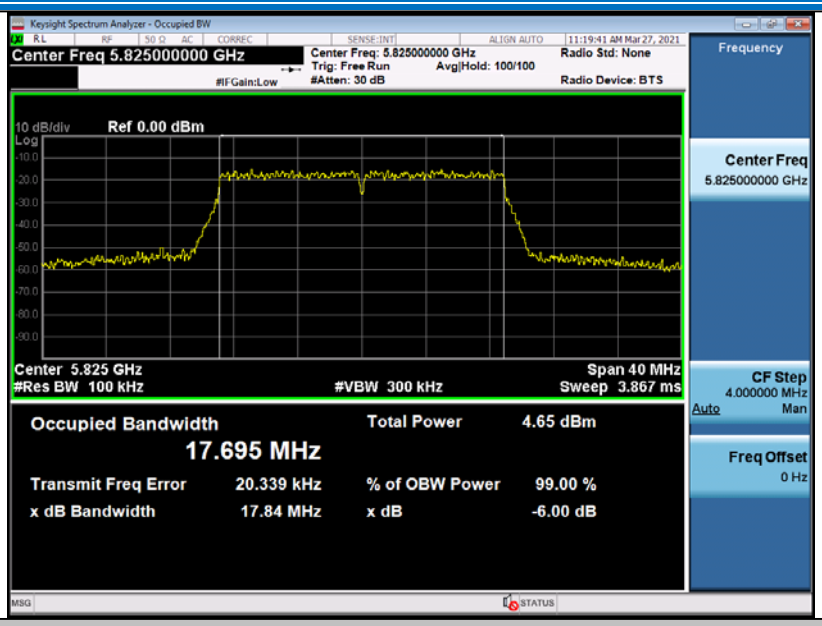
Emission Bandwidth Measurement_11N20_5745_



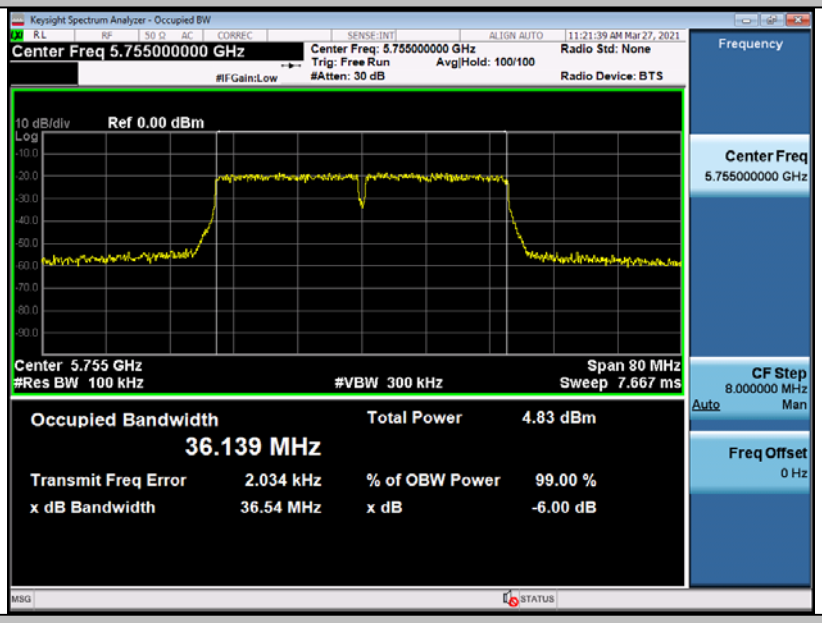
Emission Bandwidth Measurement 11N20 5785



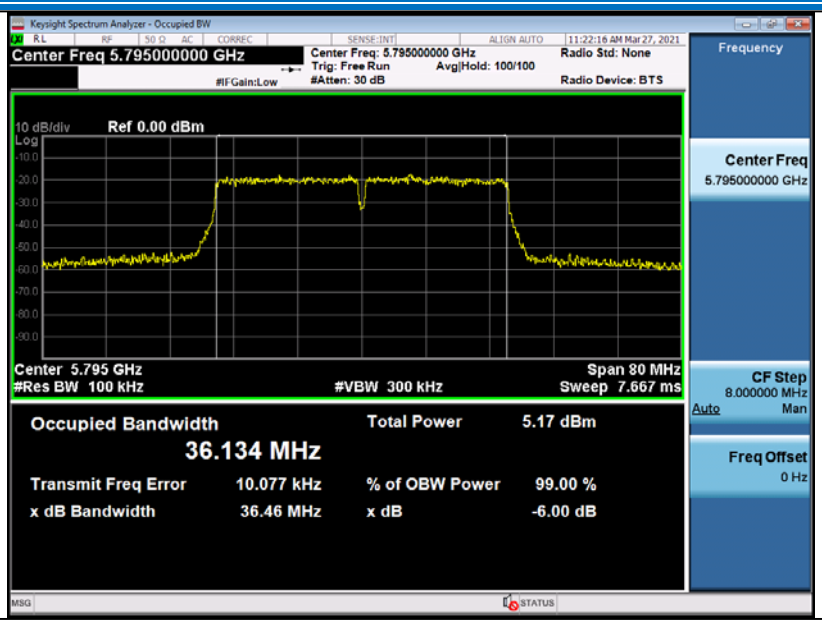
Emission Bandwidth Measurement_11N20_5825



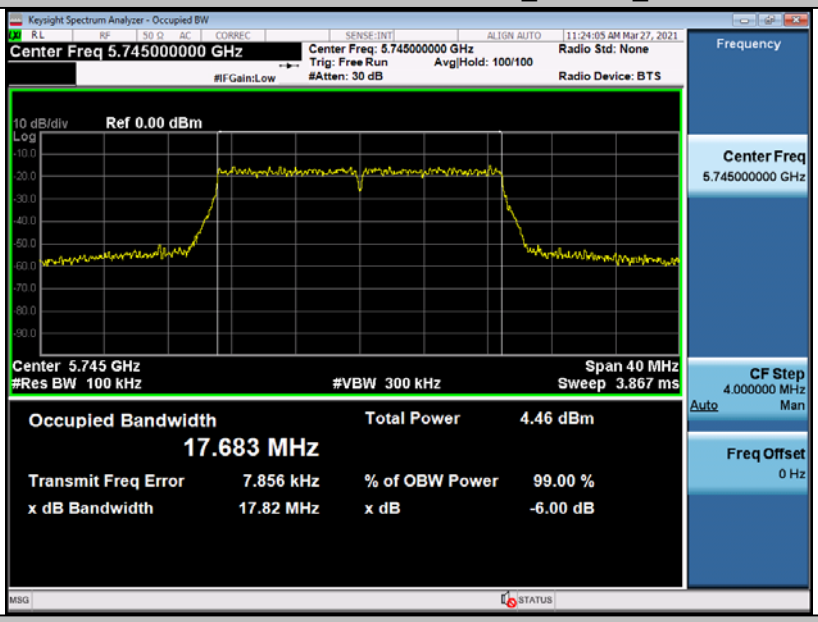
Emission Bandwidth Measurement 11N40 5755



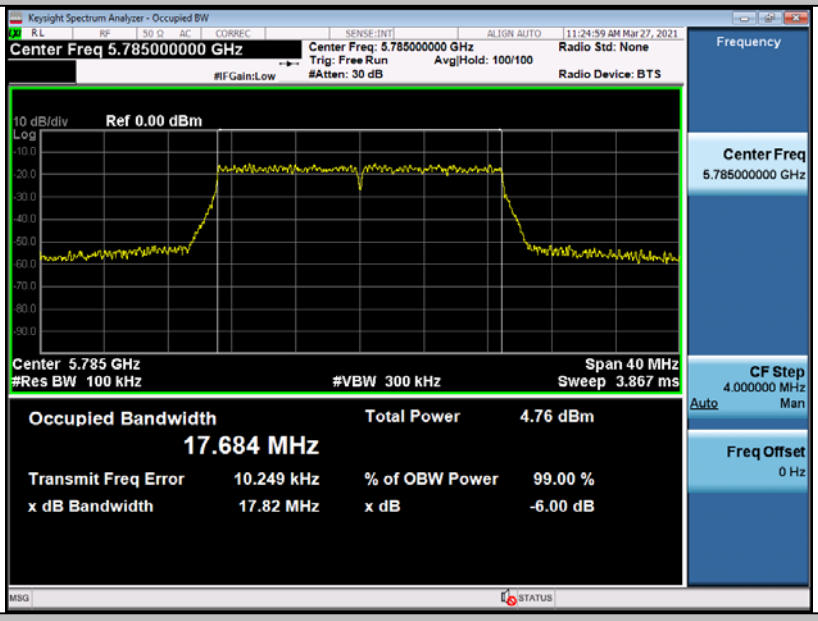
Emission Bandwidth Measurement_11N40_5795


Keysight Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 0.00 dBm
Center Freq
5.795000000 GHz
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 80 MHz
Sweep 7.667 ms
CF Step
8.000000 MHz
Auto
Man
Occupied Bandwidth
36.134 MHz
Total Power
5.17 dBm
Transmit Freq Error
10.077 kHz
% of OBW Power
99.00 %
x dB Bandwidth
36.46 MHz
x dB
-6.00 dB
Freq Offset
0 Hz

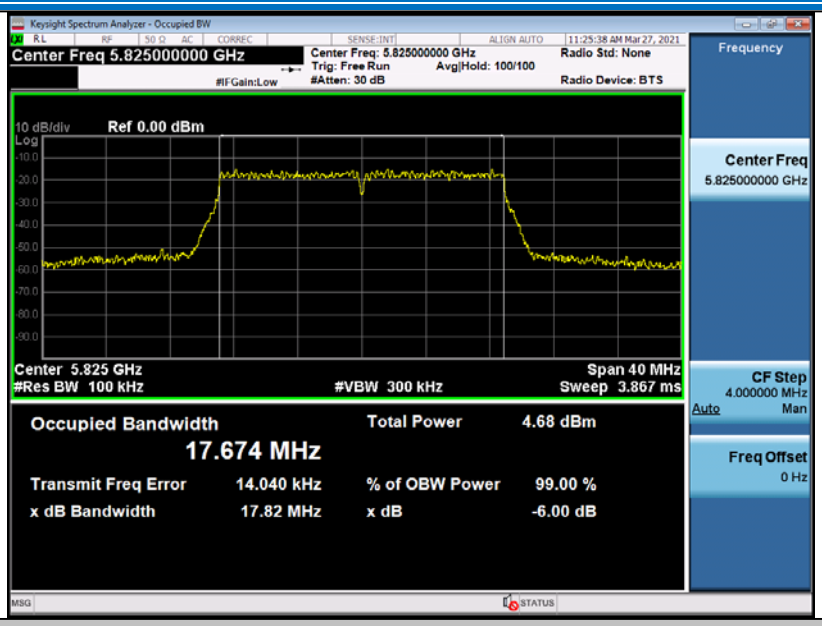
Emission Bandwidth Measurement_11AC20_5745



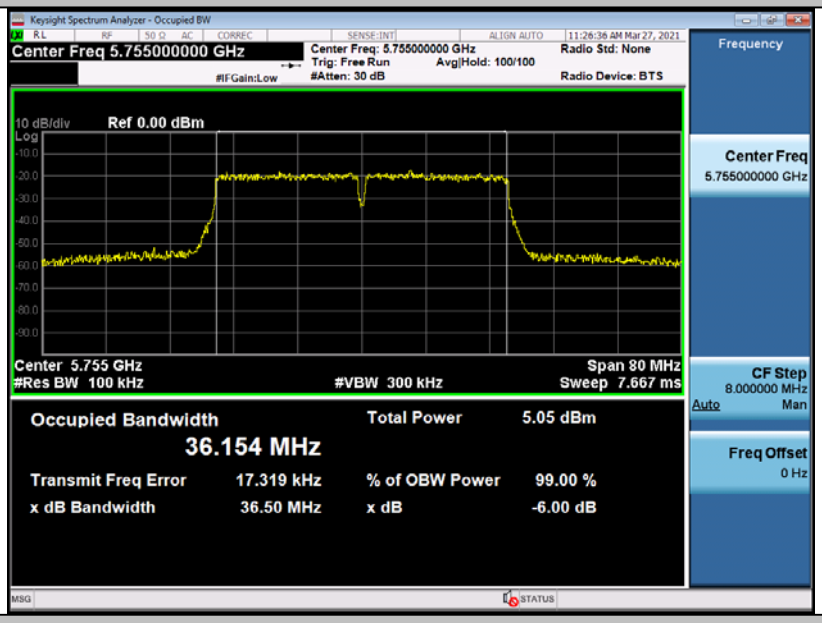
Emission Bandwidth Measurement_11AC20_5785



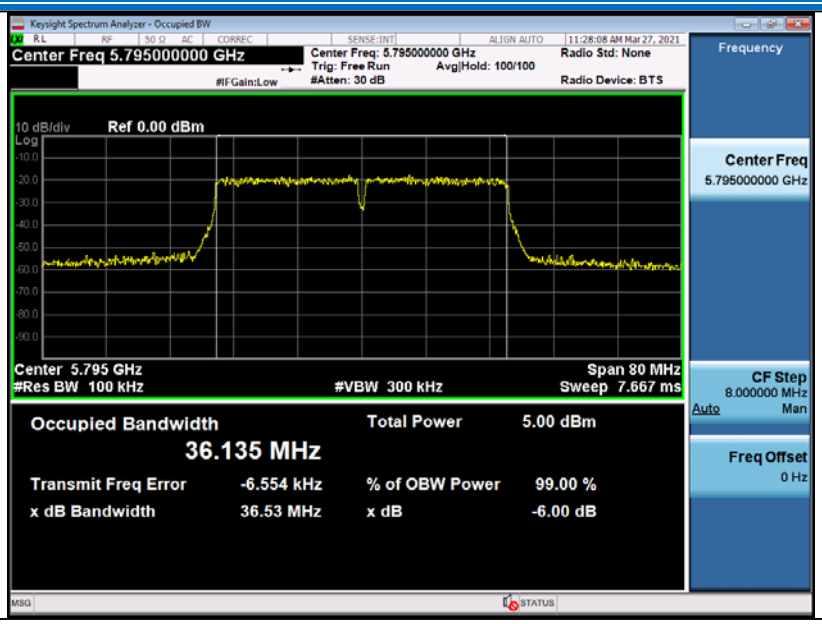
Emission Bandwidth Measurement_11AC20_5825



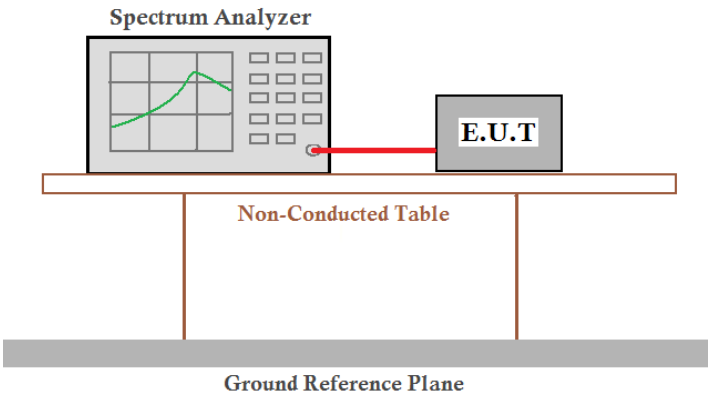
Emission Bandwidth Measurement 11AC40 5755



Emission Bandwidth Measurement_11AC40_5795


Keysight Spectrum Analyzer - Occupied BW
Center Freq 5.795000000 GHz
Center Freq: 5.795000000 GHz
Trig: Free Run
Avg|Hold: 100/100
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
Frequency
10 dB/div
Ref 0.00 dBm
Center Freq
5.795000000 GHz
Center 5.795 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 80 MHz
Sweep 7.667 ms
CF Step
8.000000 MHz
Auto
Man
Occupied Bandwidth
36.135 MHz
Total Power
5.00 dBm
Transmit Freq Error
-6.554 kHz
% of OBW Power
99.00 %
x dB Bandwidth
36.53 MHz
x dB
-6.00 dB
Freq Offset
0 Hz

5.6 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 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
	U-NII-2A	11dBm/MHz
	U-NII-2C	11dBm/MHz
	U-NII-3	30dBm/500KHz
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
11N20	5180	3.091	0	3.091	11.00	PASS
11N20	5200	3.205	0	3.205	11.00	PASS
11N20	5240	2.394	0	2.394	11.00	PASS
11N40	5190	-0.502	0	-0.502	11.00	PASS
11N40	5230	-0.807	0	-0.807	11.00	PASS
11AC20	5180	2.378	0	2.378	11.00	PASS
11AC20	5200	1.628	0	1.628	11.00	PASS
11AC20	5240	1.865	0	1.865	11.00	PASS
11AC40	5190	-0.185	0	-0.185	11.00	PASS
11AC40	5230	-0.505	0	-0.505	11.00	PASS

Remark:

PSD = Meas PSD + Duty Cycle Factor

For U-NII-3 Band:

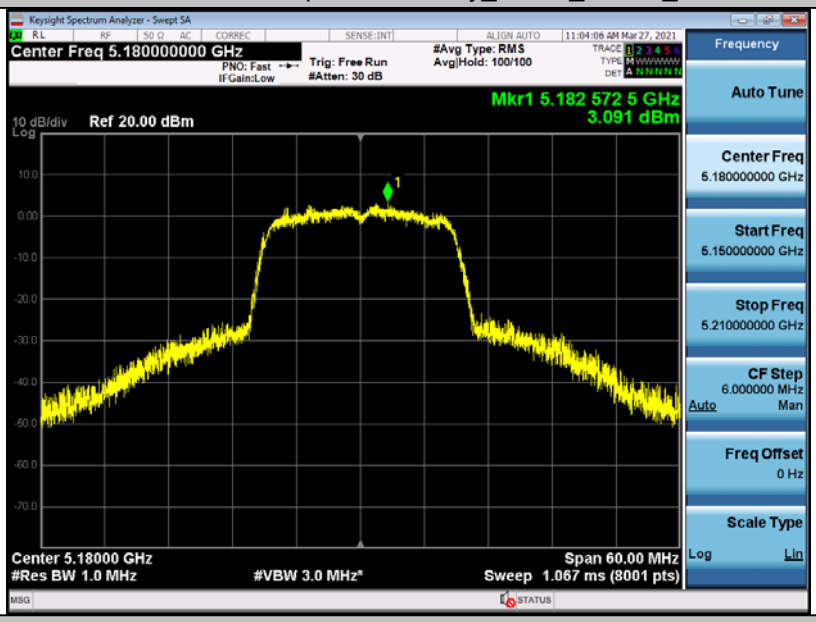
Test Mode	Test Channel	Meas PSD [dBm/500kHz]	Duty Cycle Factor [dB]	PSD [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
11N20	5745	-8.869	0	-8.869	30.00	PASS
11N20	5785	-8.773	0	-8.773	30.00	PASS
11N20	5825	-8.956	0	-8.956	30.00	PASS
11N40	5755	-9.965	0	-9.965	30.00	PASS
11N40	5795	-10.195	0	-10.195	30.00	PASS
11AC20	5745	-8.692	0	-8.692	30.00	PASS
11AC20	5785	-8.519	0	-8.519	30.00	PASS
11AC20	5825	-8.676	0	-8.676	30.00	PASS
11AC40	5755	-10.224	0	-10.224	30.00	PASS
11AC40	5795	-10.238	0	-10.238	30.00	PASS

Remark:

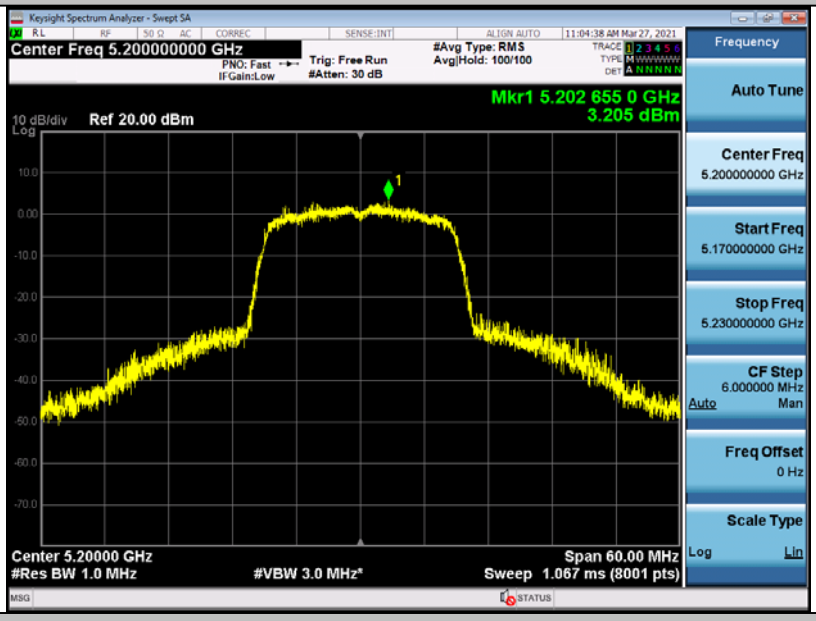
PSD = Meas PSD + Duty Cycle Factor

Test plot as follows:

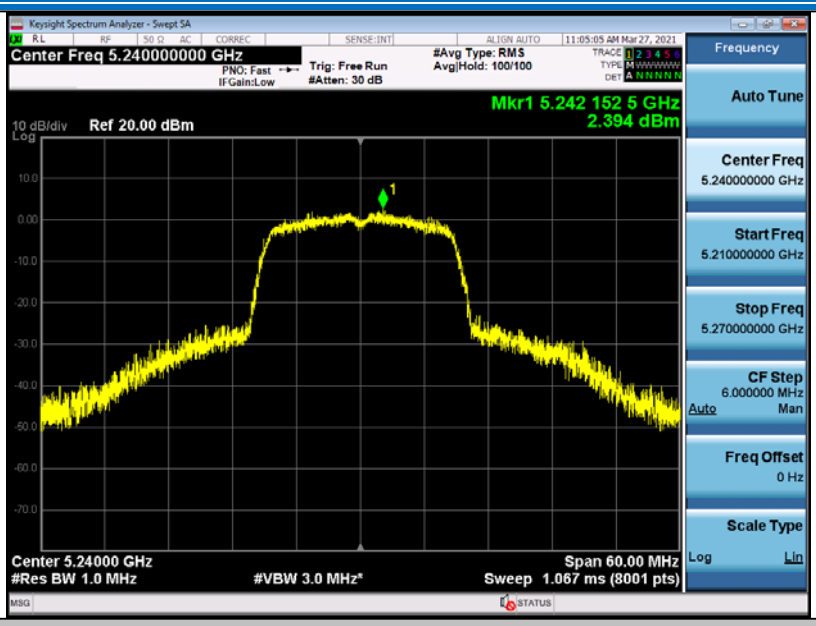
Maximum Power Spectral Density_TNVN_11N20_5180



Maximum Power Spectral Density_TNVN_11N20_5200

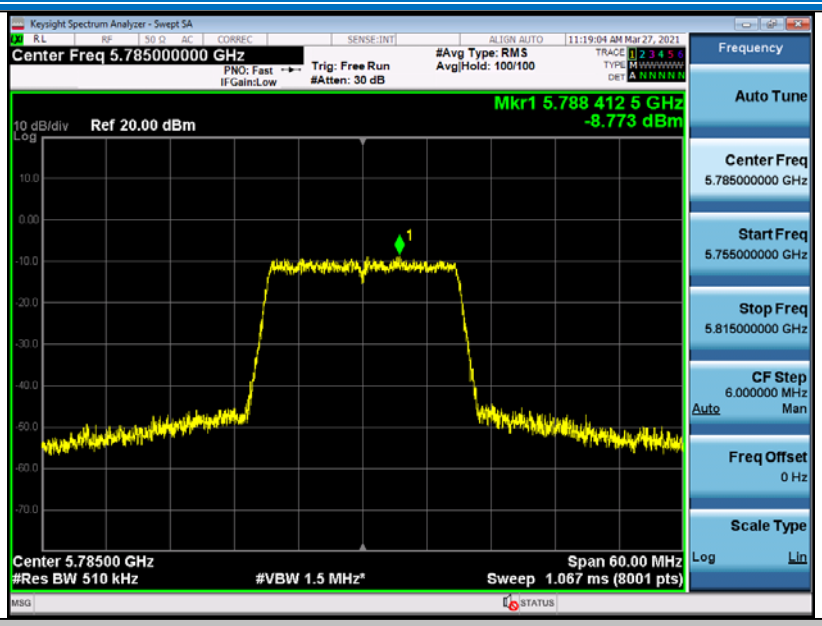


Maximum Power Spectral Density_TNVN_11N20_5240

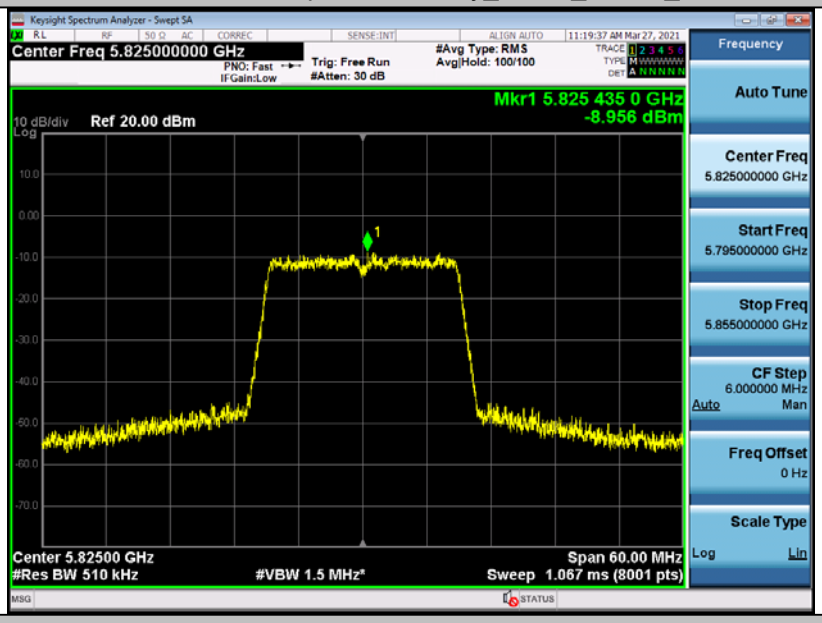


Maximum Power Spectral Density_TNVN_11N20_5745

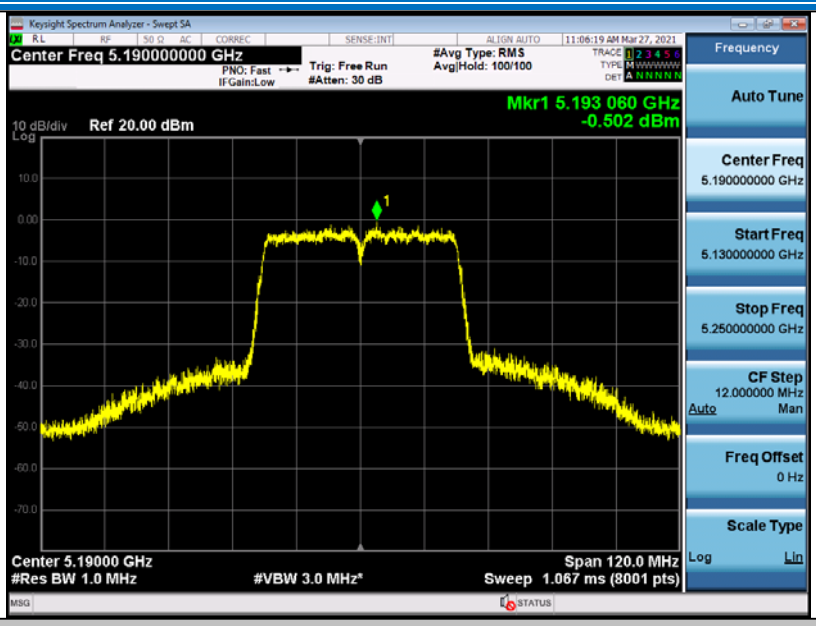
Maximum Power Spectral Density_TNVN_11N20_5785



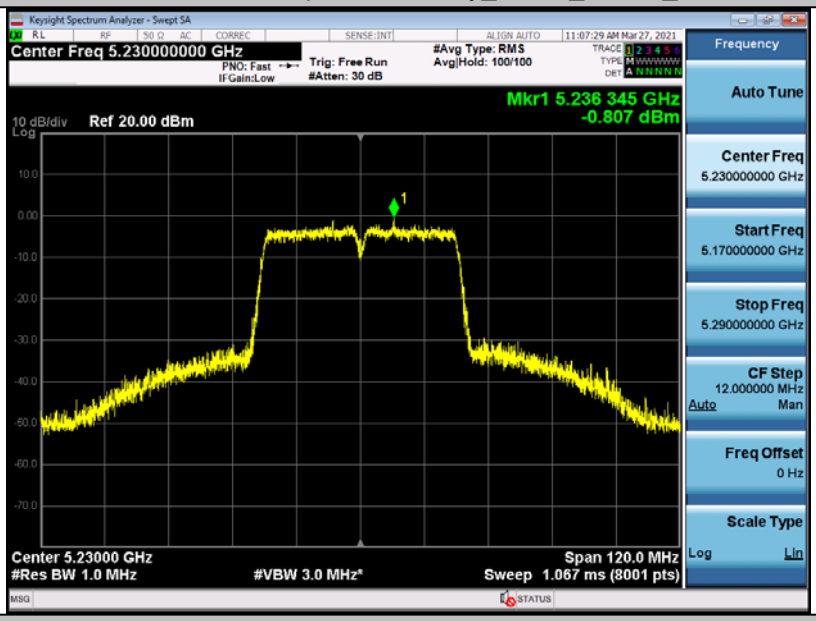
Maximum Power Spectral Density_TNVN_11N20_5825



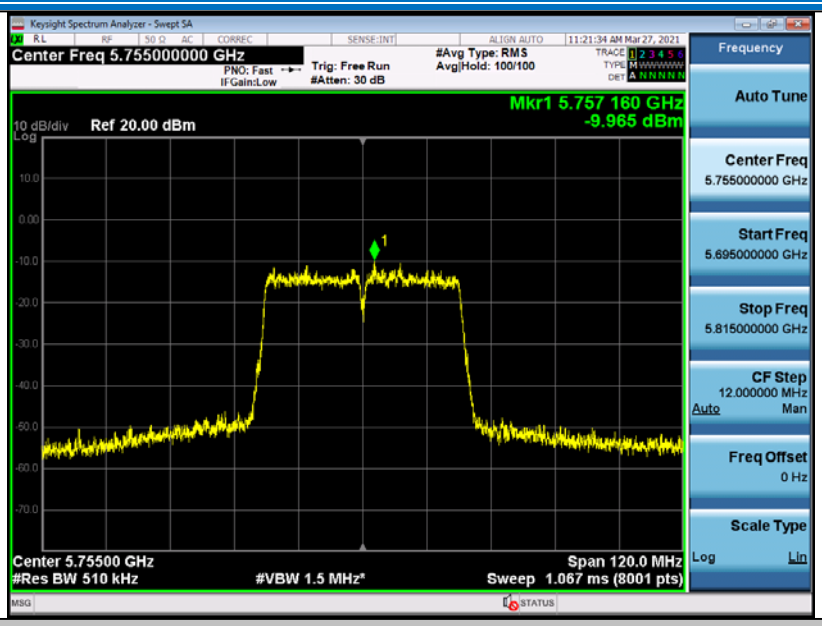
Maximum Power Spectral Density_TNVN_11N40_5190



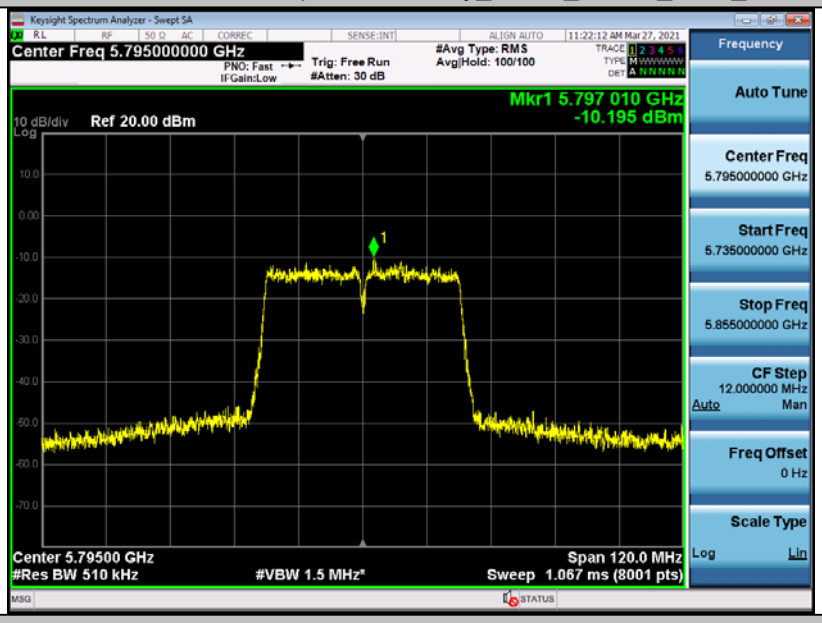
Maximum Power Spectral Density_TNVN_11N40_5230



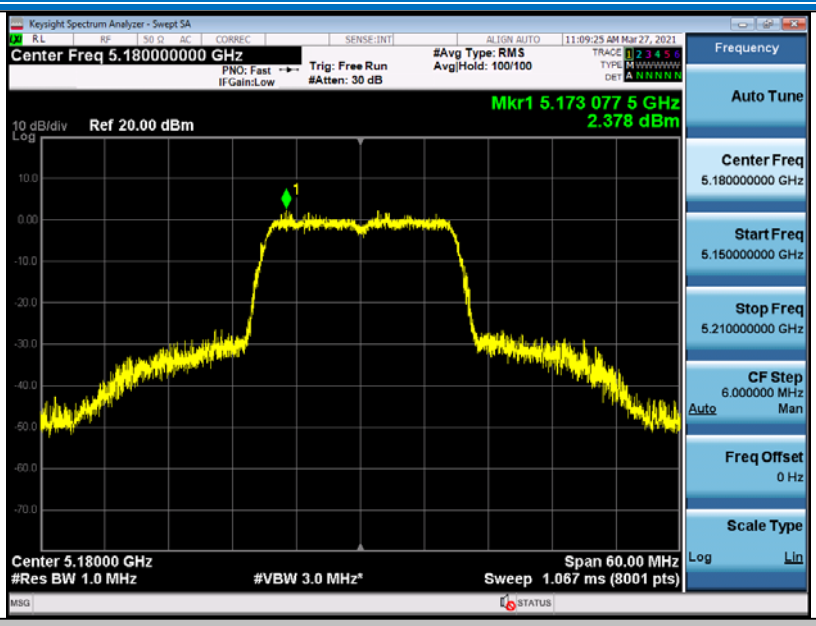
Maximum Power Spectral Density_TNVN_11N40_5755



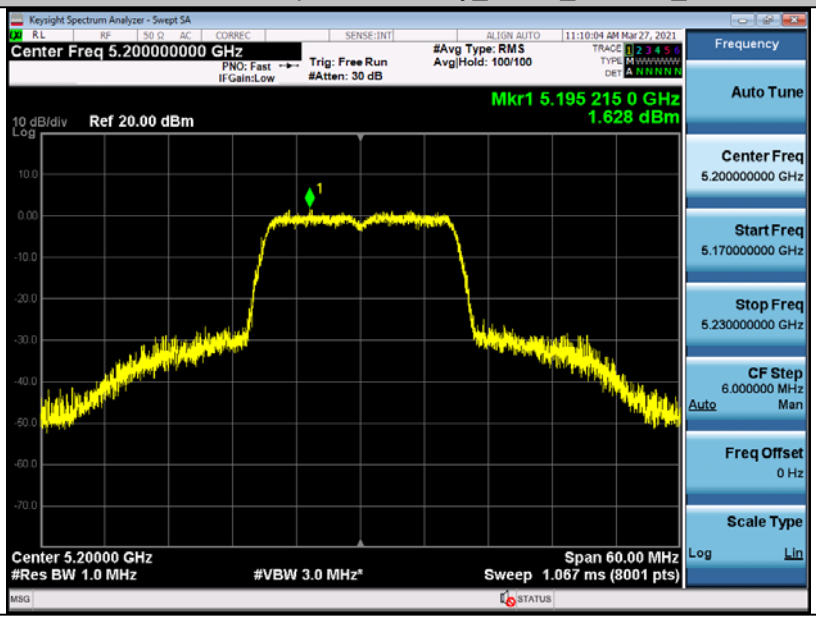
Maximum Power Spectral Density_TNVN_11N40_5795_



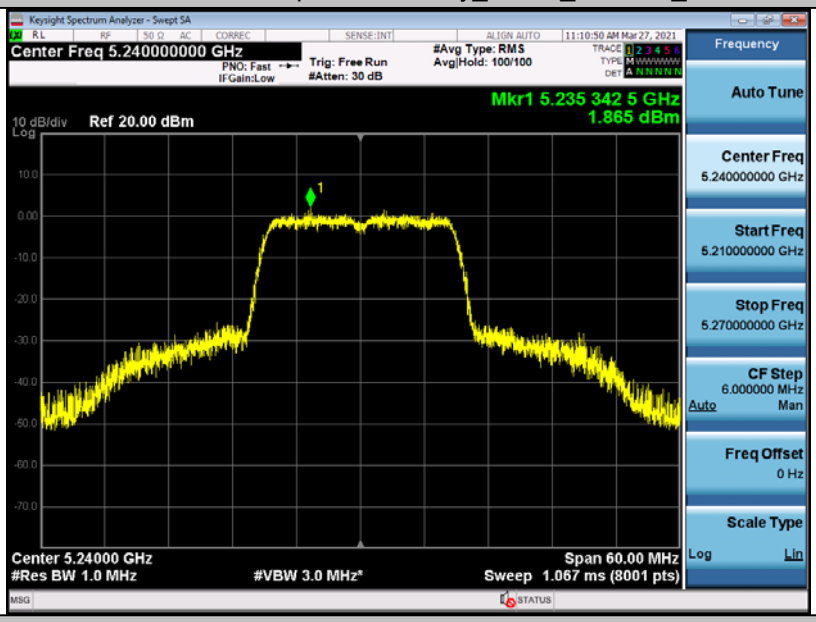
Maximum Power Spectral Density_TNVN_11AC20_5180



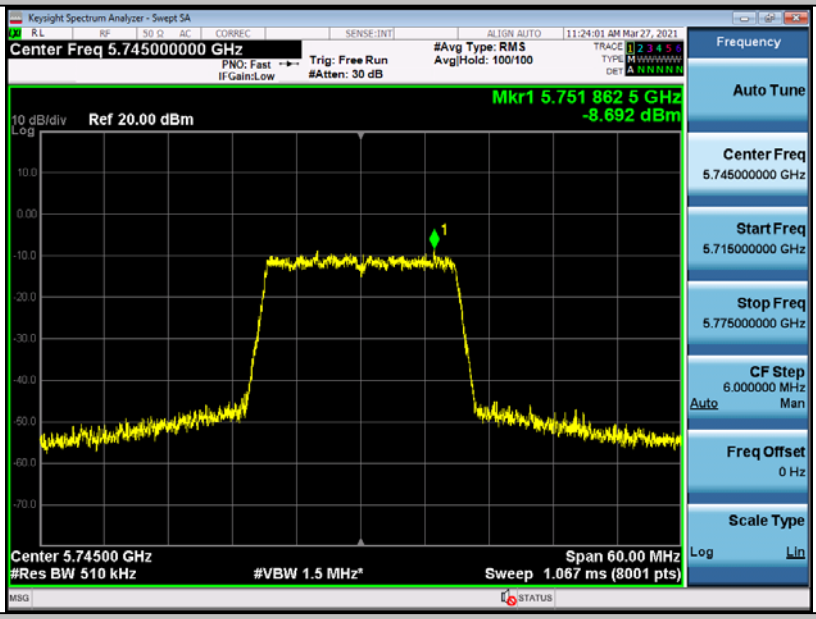
Maximum Power Spectral Density_TNVN_11AC20_5200



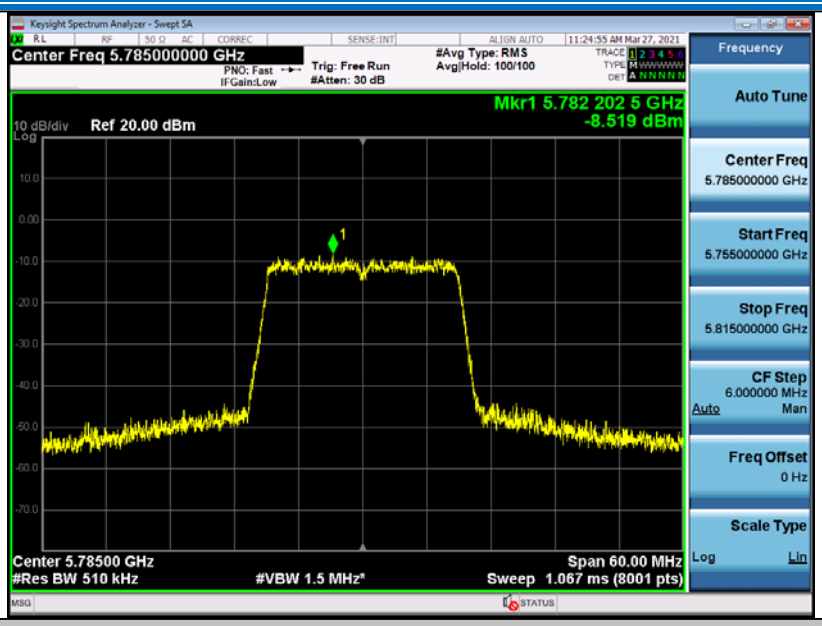
Maximum Power Spectral Density_TNVN_11AC20_5240



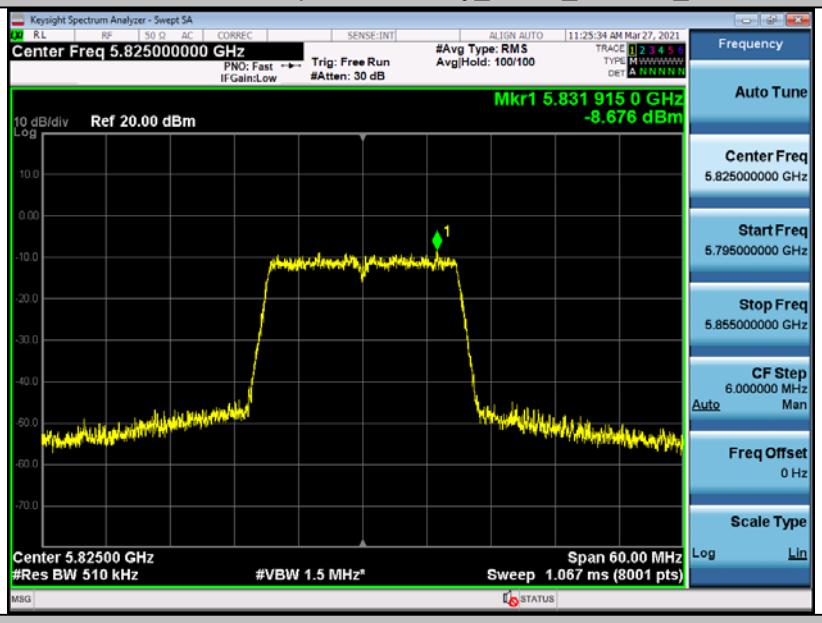
Maximum Power Spectral Density_TNVN_11AC20_5745



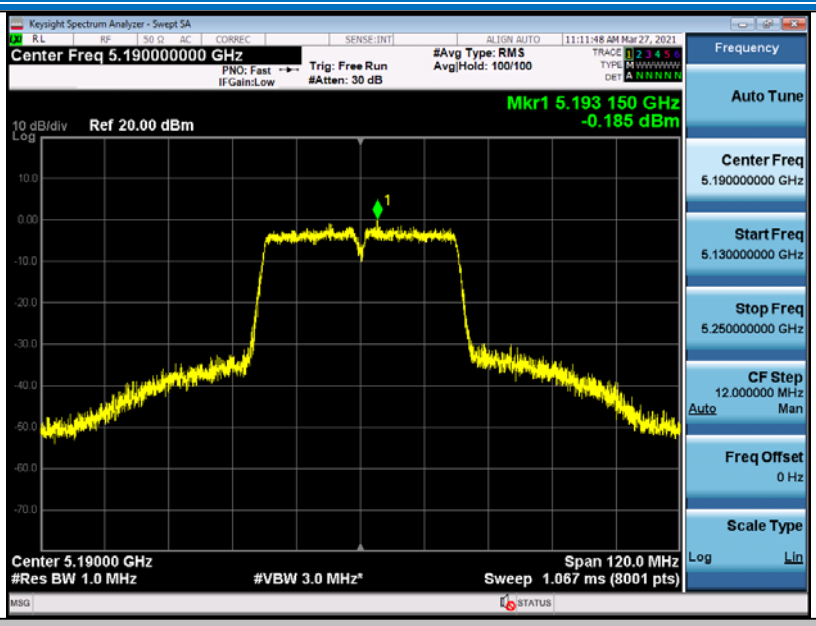
Maximum Power Spectral Density_TNVN_11AC20_5785_



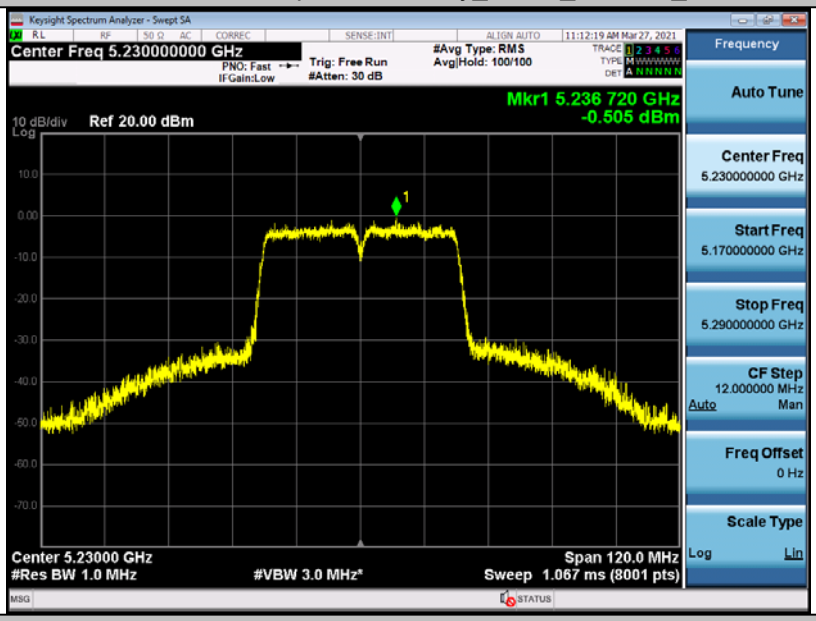
Maximum Power Spectral Density_TNVN_11AC20_5825



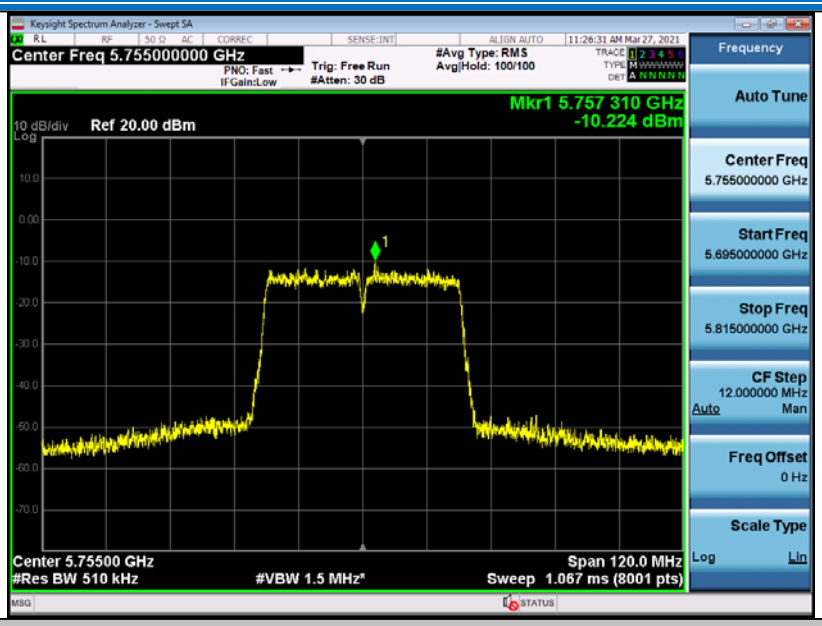
Maximum Power Spectral Density_TNVN_11AC40_5190



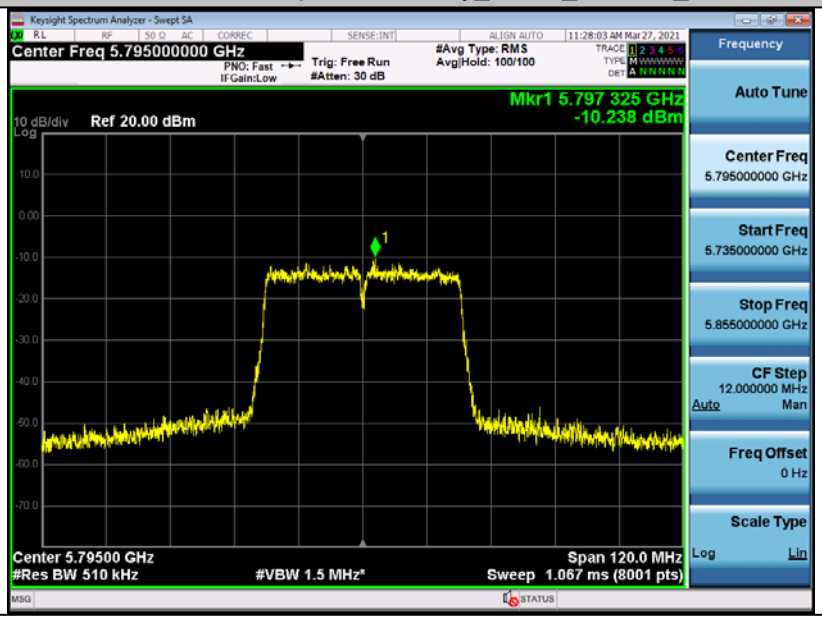
Maximum Power Spectral Density_TNVN_11AC40_5230



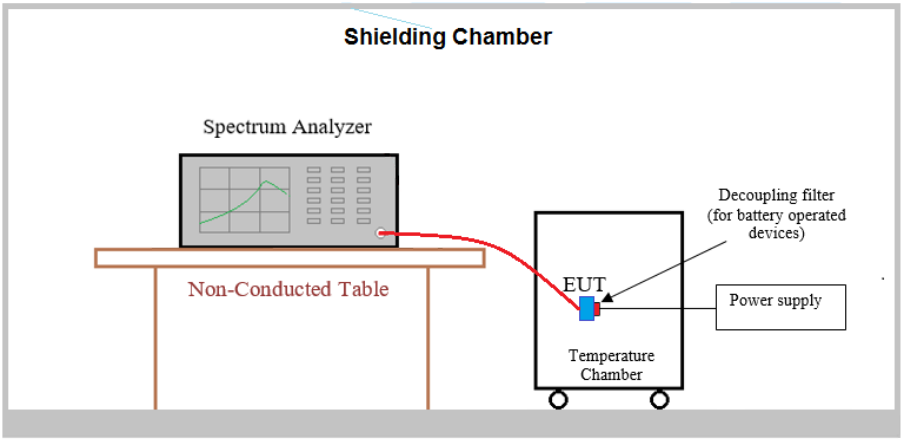
SMaximum Power Spectral Density_TNVN_11AC40_5755



Maximum Power Spectral Density_TNVN_11AC40_5795



5.7 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 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

802.11n20--5180 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5180.025	4.870
40		5180.001	0.163
30		5180.015	2.880
20		5180.009	1.744
10		5180.035	6.834
0		5180.016	3.158
-10		5180.020	3.786
-20		5180.023	4.525

802.11n20--5200 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5200.009	1.747
40		5200.022	4.300
30		5200.030	5.698
20		5200.024	4.670
10		5200.012	2.239
0		5200.020	3.792
-10		5200.015	2.890
-20		5200.019	3.664

802.11n20-- 5240 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.029	5.500
40		5240.015	2.947
30		5240.017	3.324
20		5240.010	1.934
10		5240.034	6.417
0		5240.001	0.232
-10		5240.020	3.863
-20		5240.011	2.105

802.11n40 -- 5190 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5190.019	3.667
40		5190.001	0.138
30		5190.016	3.061
20		5190.029	5.518
10		5190.014	2.607
0		5190.012	2.357
-10		5190.012	2.366
-20		5190.003	0.598

802.11n40 -- 5230 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5230.000	0.010
40		5230.019	3.688
30		5230.031	5.943
20		5230.021	4.055
10		5230.005	0.895
0		5230.036	6.905
-10		5230.007	1.246
-20		5230.005	0.908

802.11ac20--5180 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5180.031	6.028
40		5180.004	0.834
30		5180.014	2.634
20		5180.014	2.759
10		5180.032	6.152
0		5180.030	5.763
-10		5180.013	2.424
-20		5180.026	4.937

802.11ac20--5200 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5200.014	2.657
40		5200.010	1.918
30		5200.026	5.015
20		5200.030	5.778
10		5200.037	7.158
0		5200.036	6.970
-10		5200.023	4.354
-20		5200.015	2.840

802.11ac20-- 5240 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5240.018	3.482
40		5240.009	1.710
30		5240.036	6.794
20		5240.010	1.853
10		5240.031	5.871
0		5240.033	6.368
-10		5240.038	7.247
-20		5240.018	3.385

802.11ac40 -- 5190 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5190.023	4.499
40		5190.005	1.036
30		5190.013	2.513
20		5190.005	1.033
10		5190.010	1.948
0		5190.031	5.984
-10		5190.010	1.953
-20		5190.005	1.052

802.11ac40 -- 5230 MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5230.021	3.923
40		5230.031	5.995
30		5230.019	3.577
20		5230.025	4.871
10		5230.015	2.848
0		5230.027	5.179
-10		5230.035	6.737
-20		5230.024	4.555

802.11n20-- 5745MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5745.015	2.630
40		5745.035	6.107
30		5745.008	1.385
20		5745.037	6.491
10		5745.029	5.015
0		5745.009	1.549
-10		5745.034	5.903
-20		5745.038	6.588

802.11n20-- 5785MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5785.015	2.591
40		5785.033	5.707
30		5785.012	2.069
20		5785.021	3.579
10		5785.001	0.239
0		5785.016	2.729
-10		5785.012	2.089
-20		5785.025	4.357

802.11n20-- 5825MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5825.022	3.764
40		5825.023	3.903
30		5825.009	1.527
20		5825.027	4.693
10		5825.003	0.530
0		5825.028	4.792
-10		5825.004	0.700
-20		5825.020	3.475

802.11n40-- 5755MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5755.030	5.270
40		5755.018	3.178
30		5755.034	5.873
20		5755.021	3.708
10		5755.029	5.019
0		5755.017	3.004
-10		5755.030	5.172
-20		5755.034	5.855

802.11n40-- 5795MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5795.018	3.021
40		5795.023	4.034
30		5795.004	0.616
20		5795.003	0.481
10		5795.034	5.804
0		5795.019	3.197
-10		5795.023	3.925
-20		5795.035	6.046

802.11ac20-- 5745MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5745.008	1.320
40		5745.022	3.808
30		5745.032	5.526
20		5745.017	3.012
10		5745.001	0.182
0		5745.002	0.327
-10		5745.033	5.681
-20		5745.014	2.503

802.11ac20-- 5785MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5785.034	5.821
40		5785.015	2.561
30		5785.026	4.578
20		5785.008	1.408
10		5785.010	1.745
0		5785.015	2.516
-10		5785.033	5.777
-20		5785.025	4.316

802.11ac20-- 5825MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5825.012	1.994
40		5825.003	0.482
30		5825.034	5.923
20		5825.004	0.692
10		5825.011	1.839
0		5825.010	1.670
-10		5825.008	1.354
-20		5825.027	4.664

802.11ac40-- 5755MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5755.003	0.495
40		5755.006	0.983
30		5755.006	0.969
20		5755.034	5.917
10		5755.017	2.893
0		5755.019	3.329
-10		5755.038	6.574
-20		5755.035	6.150

802.11ac40-- 5795MHz			
Temp (℃)	Voltage	Measured Frequency (MHz)	Frequency Drift (ppm)
50	VN	5795.022	3.776
40		5795.018	3.126
30		5795.035	5.992
20		5795.006	1.036
10		5795.021	3.578
0		5795.025	4.321
-10		5795.022	3.846
-20		5795.008	1.304

5.8 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:	

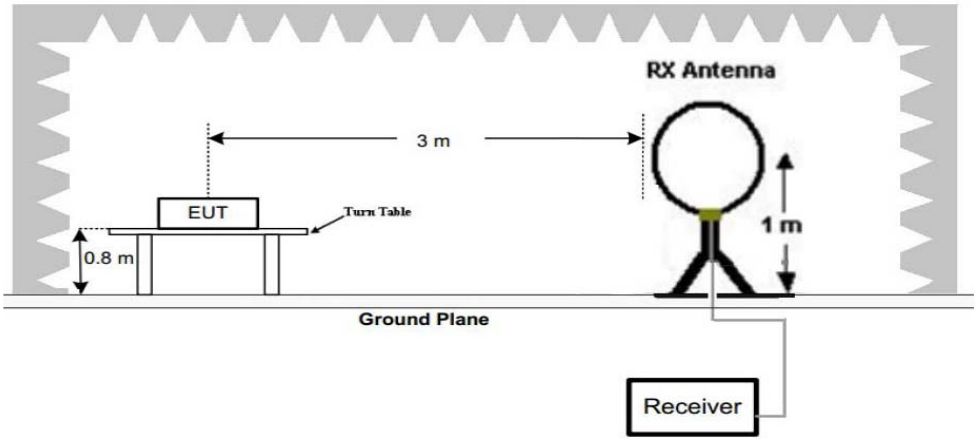


Figure 1. Below 30MHz

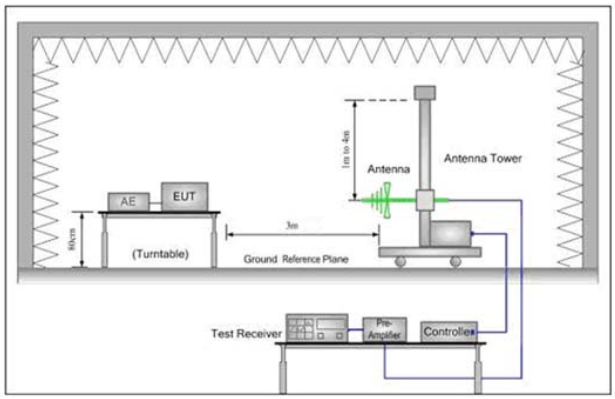


Figure 2. 30MHz to 1GHz

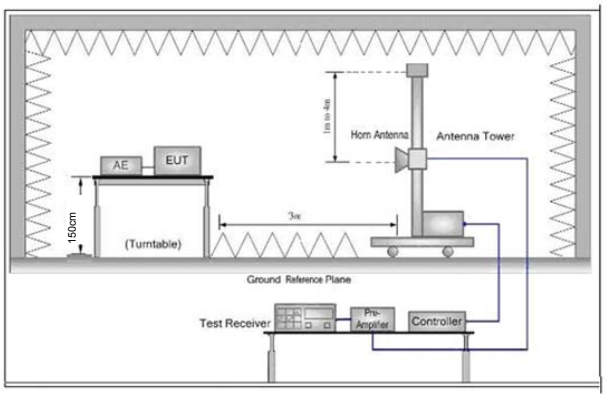


Figure 3. Above 1 GHz

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 Only the worst case is recorded in the report.
Test Results:	Pass

5.8.1Radiated emission below 1GHz

The worst case is recorded in the report No.: CQASZ20210100003EX-01

5.8.2 Transmitter emission above 1GHz

Test mode:		802.11n20(6.5Mbps)		Test channel:		36	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10360.000	51.50	2.42	53.92	74	-20.08	peak	H
10360.000	40.93	2.42	43.35	54	-10.65	AVG	H
15540.000	49.65	3.92	53.57	74	-20.43	peak	H
15540.000	37.99	3.92	41.91	54	-12.09	AVG	H
10360.000	51.20	2.42	53.62	74	-20.38	peak	V
10360.000	41.46	2.42	43.88	54	-10.12	AVG	V
15540.000	50.90	3.92	54.82	74	-19.18	peak	V
15540.000	37.12	3.92	41.04	54	-12.96	AVG	V

Test mode:		802.11n20(6.5Mbps)		Test channel:		40	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10440.000	51.84	2.23	54.07	74	-19.93	peak	H
10440.000	40.50	2.23	42.73	54	-11.27	AVG	H
15660.000	49.68	3.75	53.43	74	-20.57	peak	H
15660.000	37.26	3.75	41.01	54	-12.99	AVG	H
10440.000	51.49	2.23	53.72	74	-20.28	peak	V
10440.000	39.22	2.23	41.45	54	-12.55	AVG	V
15660.000	51.00	3.75	54.75	74	-19.25	peak	V
15660.000	36.01	3.75	39.76	54	-14.24	AVG	V

Test mode:		802.11n20(6.5Mbps)		Test channel:		48	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10480.000	50.73	2.31	53.04	74	-20.96	peak	H
10480.000	39.11	2.31	41.42	54	-12.58	AVG	H
15720.000	49.01	3.82	52.83	74	-21.17	peak	H
15720.000	38.20	3.82	42.02	54	-11.98	AVG	H
10480.000	52.91	2.31	55.22	74	-18.78	peak	V
10480.000	39.43	2.31	41.74	54	-12.26	AVG	V
15720.000	48.46	3.82	52.28	74	-21.72	peak	V
15720.000	36.68	3.82	40.50	54	-13.50	AVG	V

Test mode:		802.11n20(6.5Mbps)		Test channel:		149	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11490.000	50.65	2.42	53.07	74	-20.93	peak	H
11490.000	40.06	2.42	42.48	54	-11.52	AVG	H
17235.000	49.77	3.92	53.69	74	-20.31	peak	H
17235.000	37.54	3.92	41.46	54	-12.54	AVG	H
11490.000	52.93	2.42	55.35	74	-18.65	peak	V
11490.000	39.04	2.42	41.46	54	-12.54	AVG	V
17235.000	50.92	3.92	54.84	74	-19.16	peak	V
17235.000	39.24	3.92	43.16	54	-10.84	AVG	V

Test mode:		802.11n20(6.5Mbps)		Test channel:		157	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11570.000	52.66	2.47	55.13	74	-18.87	peak	H
11570.000	41.11	2.47	43.58	54	-10.42	AVG	H
17355.000	48.07	3.96	52.03	74	-21.97	peak	H
17355.000	39.90	3.96	43.86	54	-10.14	AVG	H
11570.000	50.19	2.47	52.66	74	-21.34	peak	V
11570.000	41.57	2.47	44.04	54	-9.96	AVG	V
17355.000	48.99	3.96	52.95	74	-21.05	peak	V
17355.000	39.61	3.96	43.57	54	-10.43	AVG	V

Test mode:		802.11n20(6.5Mbps)		Test channel:		165	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11650.000	50.75	2.55	53.30	74	-20.70	peak	H
11650.000	39.74	2.55	42.29	54	-11.71	AVG	H
17475.000	48.55	4.01	52.56	74	-21.44	peak	H
17475.000	37.04	4.01	41.05	54	-12.95	AVG	H
11650.000	50.54	2.55	53.09	74	-20.91	peak	V
11650.000	39.54	2.55	42.09	54	-11.91	AVG	V
17475.000	50.81	4.01	54.82	74	-19.18	peak	V
17475.000	37.18	4.01	41.19	54	-12.81	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		36	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10360.000	50.51	2.13	52.64	74	-21.36	peak	H
10360.000	39.45	2.13	41.58	54	-12.42	AVG	H
15540.000	50.65	3.62	54.27	74	-19.73	peak	H
15540.000	39.20	3.62	42.82	54	-11.18	AVG	H
10360.000	51.67	2.13	53.80	74	-20.20	peak	V
10360.000	40.90	2.13	43.03	54	-10.97	AVG	V
15540.000	48.68	3.62	52.30	74	-21.70	peak	V
15540.000	36.35	3.62	39.97	54	-14.03	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		40	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10440.000	50.30	2.23	52.53	74	-21.47	peak	H
10440.000	41.11	2.23	43.34	54	-10.66	AVG	H
15660.000	50.40	3.75	54.15	74	-19.85	peak	H
15660.000	37.29	3.75	41.04	54	-12.96	AVG	H
10440.000	51.43	2.23	53.66	74	-20.34	peak	V
10440.000	39.34	2.23	41.57	54	-12.43	AVG	V
15660.000	49.90	3.75	53.65	74	-20.35	peak	V
15660.000	39.12	3.75	42.87	54	-11.13	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		48	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
10480.000	51.88	2.31	54.19	74	-19.81	peak	H
10480.000	39.47	2.31	41.78	54	-12.22	AVG	H
15720.000	50.77	3.82	54.59	74	-19.41	peak	H
15720.000	38.25	3.82	42.07	54	-11.93	AVG	H
10480.000	51.42	2.31	53.73	74	-20.27	peak	V
10480.000	39.87	2.31	42.18	54	-11.82	AVG	V
15720.000	50.17	3.82	53.99	74	-20.01	peak	V
15720.000	37.10	3.82	40.92	54	-13.08	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		149	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11490.000	50.72	2.42	53.14	74	-20.86	peak	H
11490.000	41.66	2.42	44.08	54	-9.92	AVG	H
17235.000	48.39	3.92	52.31	74	-21.69	peak	H
17235.000	35.98	3.92	39.90	54	-14.10	AVG	H
11490.000	52.30	2.42	54.72	74	-19.28	peak	V
11490.000	39.17	2.42	41.59	54	-12.41	AVG	V
17235.000	48.67	3.92	52.59	74	-21.41	peak	V
17235.000	39.06	3.92	42.98	54	-11.02	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		157	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11570.000	51.46	2.47	53.93	74	-20.07	peak	H
11570.000	39.70	2.47	42.17	54	-11.83	AVG	H
17355.000	49.07	3.96	53.03	74	-20.97	peak	H
17355.000	38.39	3.96	42.35	54	-11.65	AVG	H
11570.000	50.13	2.47	52.60	74	-21.40	peak	V
11570.000	41.46	2.47	43.93	54	-10.07	AVG	V
17355.000	49.97	3.96	53.93	74	-20.07	peak	V
17355.000	38.46	3.96	42.42	54	-11.58	AVG	V

Test mode:		802.11ac20(6.5Mbps)		Test channel:		165	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
11650.000	50.37	2.55	52.92	74	-21.08	peak	H
11650.000	41.61	2.55	44.16	54	-9.84	AVG	H
17475.000	50.96	4.01	54.97	74	-19.03	peak	H
17475.000	39.65	4.01	43.66	54	-10.34	AVG	H
11650.000	51.48	2.55	54.03	74	-19.97	peak	V
11650.000	41.09	2.55	43.64	54	-10.36	AVG	V
17475.000	50.21	4.01	54.22	74	-19.78	peak	V
17475.000	36.09	4.01	40.10	54	-13.90	AVG	V

Remark:

1) The 6.5Mbps of rate of 802.11n is the worst case.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

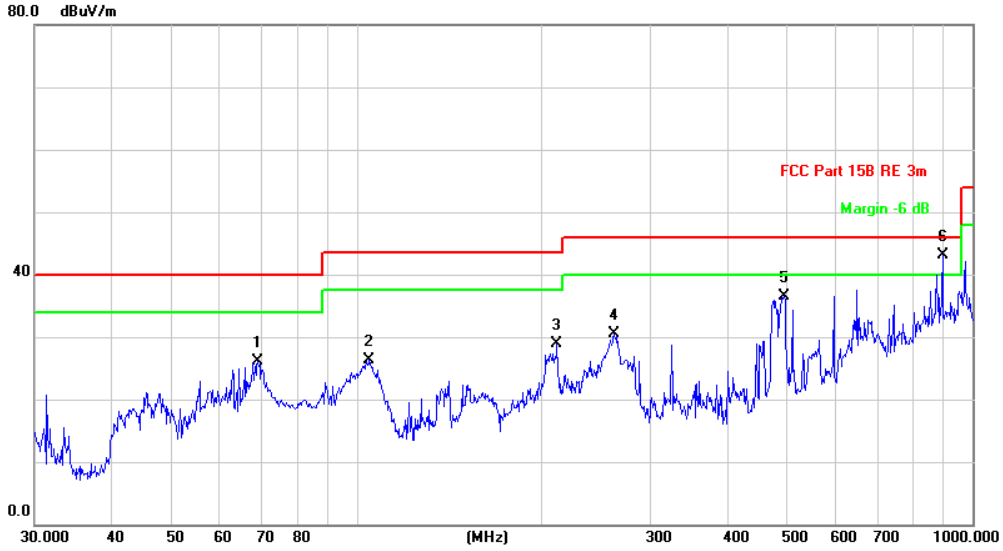
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 40GHz,The disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

Simultaneous Tx Radiated Spurious Emissions Measurements

Description	2.4 GHz Emission	5 GHz Emission
Channel	1	36
Operating Frequency (MHz)	2412	5180
Data Rate (Mbps)	DSSS/1Mbps	OFDM/ 13.5Mbps
Mode	2.4GWIFI-802.11b	UNII-1-ac20

30MHz-1GHz		
Test mode:	Transmitting (802.11b-2412MHz & UNII-1-ac20-5180MHz)	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		69.1141	43.06	-16.99	26.07	40.00	-13.93	QP			
2		104.9033	41.68	-15.42	26.26	43.50	-17.24	QP			
3		211.5265	46.59	-17.66	28.93	43.50	-14.57	QP			
4		261.9753	42.50	-11.98	30.52	46.00	-15.48	QP			
5		494.1984	40.40	-3.82	36.58	46.00	-9.42	QP			
6	*	893.8567	35.93	7.29	43.22	46.00	-2.78	QP			

Remark:

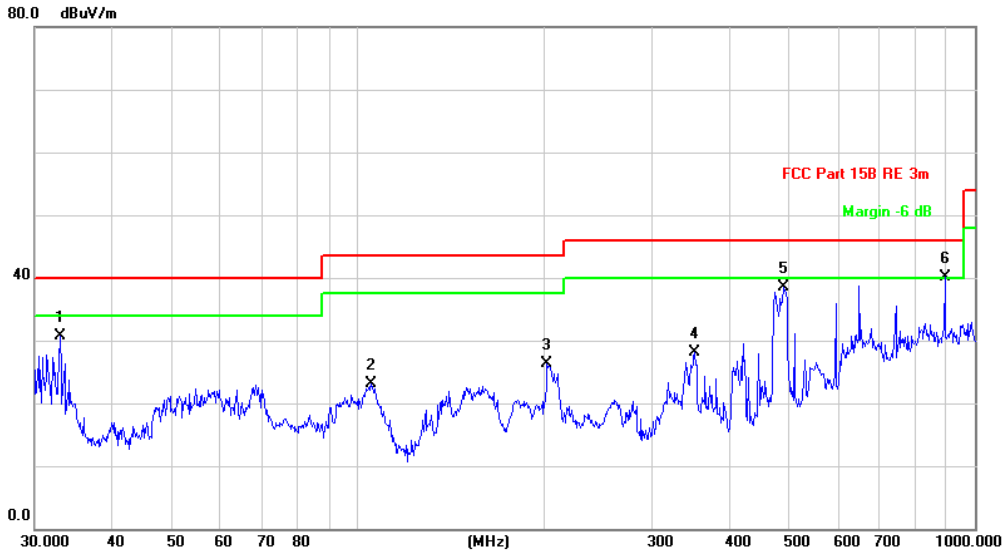
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Test mode:	Transmitting (802.11b-2412MHz & UNII-1-ac20-5180MHz)	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		32.9791	42.33	-11.72	30.61	40.00	-9.39	QP			
2		105.2718	38.52	-15.40	23.12	43.50	-20.38	QP			
3		202.8104	41.57	-15.21	26.36	43.50	-17.14	QP			
4		351.7079	38.49	-10.37	28.12	46.00	-17.88	QP			
5		489.0269	42.60	-4.17	38.43	46.00	-7.57	QP			
6	*	893.8567	32.79	7.29	40.08	46.00	-5.92	QP			

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Factor= Antenna Factor + Cable Factor – Preamplifier Factor,

Level = Read Level + Factor,

Over Limit=Level-Limit Line.

Above 1GHz

Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4874.00	52.08	-4.12	47.96	74	-26.04	peak	H
4874.00	39.99	-4.12	35.87	54	-18.13	AVG	H
7311.00	52.61	1.46	54.07	74	-19.93	peak	H
7311.00	40.31	1.46	41.77	54	-12.23	AVG	H
10360.00	52.19	2.42	54.61	74	-19.39	peak	H
10360.00	39.45	2.42	41.87	54	-12.13	AVG	H
15540.00	49.71	3.92	53.63	74	-20.37	peak	H
15540.00	38.25	3.92	42.17	54	-11.83	AVG	H
4874.00	51.89	-4.12	47.77	74	-26.23	peak	V
4874.00	40.21	-4.12	36.09	54	-17.91	AVG	V
7311.00	52.22	1.46	53.68	74	-20.32	peak	V
7311.00	40.63	1.46	42.09	54	-11.91	AVG	V
10360.00	50.36	2.42	52.78	74	-21.22	peak	V
10360.00	41.05	2.42	43.47	54	-10.53	AVG	V
15540.00	50.88	3.92	54.80	74	-19.20	peak	V
15540.00	38.11	3.92	42.03	54	-11.97	AVG	V

Remark:

1) Scan from 9kHz to 40GHz,The disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

5.9 Restricted bands around fundamental frequency

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)
Limit:	

Applicable To	**Limit**	
789033 D02 General U-NII Test Procedures New Rules v02r01	**Field Strength at 3 m**	
	PK: 74 (dBμV/m)	**AV: 54 (dBμV/m)**
Applicable To	EIRP Limit	Equivalent Field Strength at 3 m
FCC 47 CFR Part 15 Subpart E Section 6.2.1.2	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
FCC 47 CFR Part 15 Subpart E Section 6.2.2.2	PK: -27 (dBm/MHz)	PK: 74 (dBμV/m)
FCC 47 CFR Part 15 Subpart E Section 6.2.3.2	PK: -27 (dBm/MHz)	PK: 68.2 (dBμV/m)
FCC 47 CFR Part 15 Subpart E Section 6.2.4.2	27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;	PK: 68.2 (dBμV/m)
	15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;	
	10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges;	

		-27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.	

Test Setup:

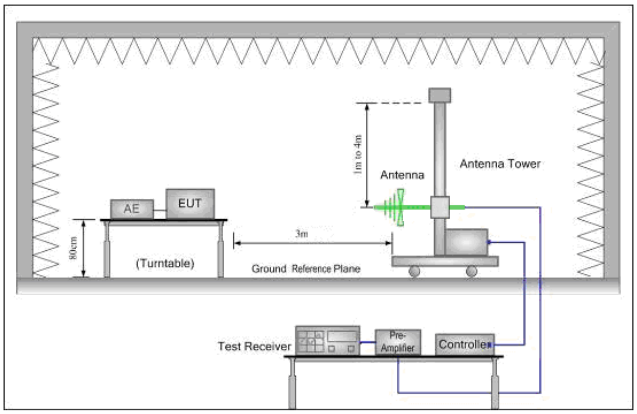


Figure 1. 30MHz to 1GHz

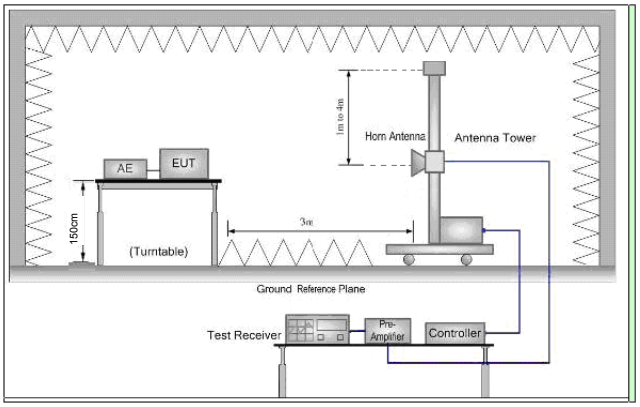


Figure 2. Above 1 GHz

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 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. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

	g. Test the EUT in the lowest 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 Through Pre-scan, find 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40); 6.5Mbps of rate is the worst case of 802.11ac(VHT20) ; 13.5Mbps of rate is the worst case of 802.11ac(VHT40); Only the worst case is recorded in the report.
Test Results:	Pass

Test data:

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		36	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5150.00	51.05	-3.63	47.42	74	-26.58	peak	H
5150.00	39.55	-3.63	35.92	54	-18.08	AVG	H
5150.00	48.45	-3.63	44.82	74	-29.18	peak	V
5150.00	37.33	-3.63	33.70	54	-20.30	AVG	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		48	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5350.00	50.67	-3.59	47.08	74	-26.92	peak	H
5350.00	41.01	-3.59	37.42	54	-16.58	AVG	H
5350.00	50.73	-3.59	47.14	74	-26.86	peak	V
5350.00	38.53	-3.59	34.94	54	-19.06	AVG	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		149	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5650.00	50.97	-3.46	47.51	74	-26.49	peak	H
5751.09	41.59	-3.44	38.15	54	-15.85	peak	H
5650.00	48.68	-3.46	45.22	74	-28.78	peak	V
5744.27	38.94	-3.44	35.50	54	-18.50	peak	V

Worse case mode:		802.11n(HT20)(6.5Mbps)		Test channel:		165	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5823.41	51.96	-3.42	48.54	74	-25.46	peak	H
5925.00	40.72	-3.41	37.31	54	-16.69	peak	H
5824.65	51.32	-3.42	47.90	74	-26.10	peak	V
5925.00	41.02	-3.41	37.61	54	-16.39	peak	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		38	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V

5150.00	52.12	-3.63	48.49	74	-25.51	peak	H
5150.00	40.69	-3.63	37.06	54	-16.94	AVG	H
5150.00	49.03	-3.63	45.40	74	-28.60	peak	V
5150.00	36.72	-3.63	33.09	54	-20.91	AVG	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		46	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5350.00	52.26	-3.59	48.67	74	-25.33	peak	H
5350.00	41.38	-3.59	37.79	54	-16.21	AVG	H
5350.00	49.12	-3.59	45.53	74	-28.47	peak	V
5350.00	38.57	-3.59	34.98	54	-19.02	AVG	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		151	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5650.00	51.45	-3.46	47.99	74	-26.01	peak	H
5762.61	39.12	-3.44	35.68	54	-18.32	peak	H
5650.00	48.61	-3.46	45.15	74	-28.85	peak	V
5741.70	37.46	-3.44	34.02	54	-19.98	peak	V

Worse case mode:		802.11n(HT40)(13.5Mbps)		Test channel:		159	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5743.60	51.72	-3.42	48.30	74	-25.70	peak	H
5925.00	41.83	-3.41	38.42	54	-15.58	peak	H
5779.52	50.57	-3.42	47.15	74	-26.85	peak	V
5925.00	38.49	-3.41	35.08	54	-18.92	peak	V

Worse case mode:		802.11ac(HT20)(6.5Mbps)		Test channel:		36	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5150.00	50.63	-3.63	47.00	74	-27.00	peak	H
5150.00	40.89	-3.63	37.26	54	-16.74	AVG	H
5150.00	51.02	-3.63	47.39	74	-26.61	peak	V
5150.00	36.85	-3.63	33.22	54	-20.78	AVG	V

Worse case mode:		802.11ac(HT20)(6.5Mbps)		Test channel:		48	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5350.00	50.58	-3.59	46.99	74	-27.01	peak	H
5350.00	39.70	-3.59	36.11	54	-17.89	AVG	H
5350.00	48.06	-3.59	44.47	74	-29.53	peak	V
5350.00	39.35	-3.59	35.76	54	-18.24	AVG	V

Worse case mode:		802.11ac(HT20)(6.5Mbps)		Test channel:		149	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5650.00	52.99	-3.46	49.53	74	-24.47	peak	H
5743.54	41.84	-3.44	38.40	54	-15.60	peak	H
5650.00	50.75	-3.46	47.29	74	-26.71	peak	V
5739.28	39.72	-3.44	36.28	54	-17.72	peak	V

Worse case mode:		802.11ac(HT20)(6.5Mbps)		Test channel:		165	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5831.03	52.89	-3.42	49.47	74	-24.53	peak	H
5925.00	41.73	-3.41	38.32	54	-15.68	peak	H
5825.11	48.69	-3.42	45.27	74	-28.73	peak	V
5925.00	37.20	-3.41	33.79	54	-20.21	peak	V

Worse case mode:		802.11ac(VHT40)(13.5Mbps)		Test channel:		38	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5150.00	52.26	-3.63	48.63	74	-25.37	peak	H
5150.00	40.54	-3.63	36.91	54	-17.09	AVG	H
5150.00	50.75	-3.63	47.12	74	-26.88	peak	V
5150.00	37.40	-3.63	33.77	54	-20.23	AVG	V

Worse case mode:		802.11ac(VHT40)(13.5Mbps)		Test channel:		46	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5350.00	50.69	-3.59	47.10	74	-26.90	peak	H

5350.00	39.15	-3.59	35.56	54	-18.44	AVG	H
5350.00	48.41	-3.59	44.82	74	-29.18	peak	V
5350.00	36.72	-3.59	33.13	54	-20.87	AVG	V

Worse case mode:		802.11ac(VHT40)(13.5Mbps)		Test channel:		151	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5650.00	50.94	-3.46	47.48	74	-26.52	peak	H
5751.19	40.35	-3.44	36.91	54	-17.09	peak	H
5650.00	49.29	-3.46	45.83	74	-28.17	peak	V
5741.72	38.92	-3.44	35.48	54	-18.52	peak	V

Worse case mode:		802.11ac(VHT40)(13.5Mbps)		Test channel:		159	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
5771.12	50.31	-3.42	46.89	74	-27.11	peak	H
5925.00	41.26	-3.41	37.85	54	-16.15	peak	H
5806.53	49.85	-3.42	46.43	74	-27.57	peak	V
5925.00	38.56	-3.41	35.15	54	-18.85	peak	V

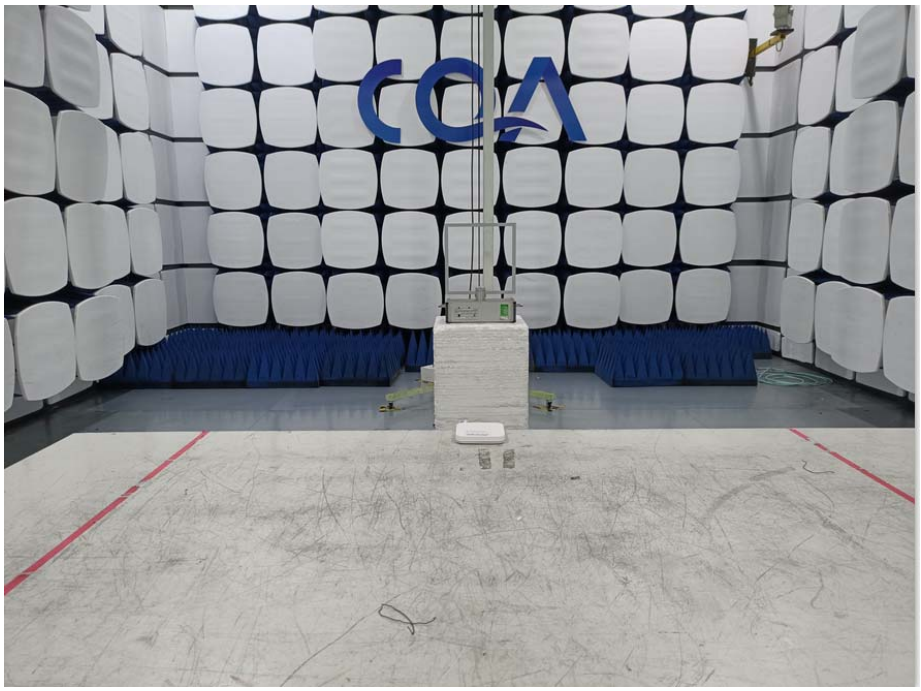
Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

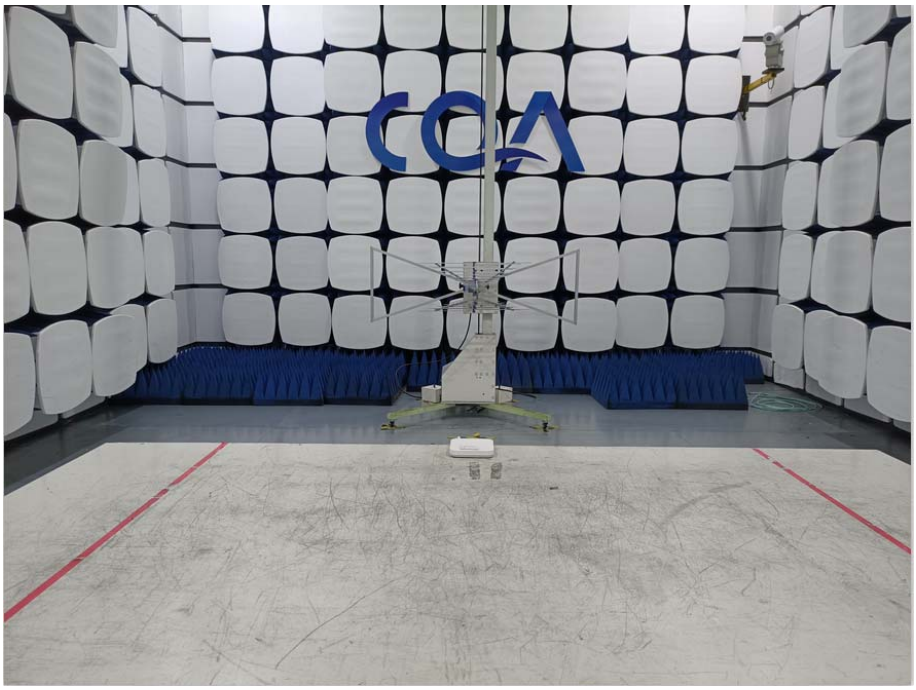
6 Photographs - EUT Test Setup

6.1Radiated Emission

9kHz~30MHz:



30MHz~1GHz:



Above 1GHz:

6.2Conducted Emissions Test Setup

7 Photographs - EUT Constructional Details

Please refer to the report No: CQASZ20210300017EX-01

THE END