



Shenzhen Huaxia Testing Technology Co., Ltd

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

Telephone: +86-755-26648640

Fax: +86-755-26648637

Website: www.cqa-cert.com

Report Template Version: V03

Report Template Revision Date: Mar.1st, 2017

Test Report

Report No. : CQASZ20210100002EX-02

Applicant: SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD

Address of Applicant: No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China

Manufacturer: SHENZHEN AMEDIATECH TECHNOLOGY CO.,LTD

Address of Manufacturer: No.01, 2/F, A Plant, Block B, Minsheng Industrial Park, Longmei Road, Gaofeng community, Dalang office, Longhua District, Shenzhen, China

Equipment Under Test (EUT):

Product: Set Top Box

All Model No.: X96 mini+

Test Model No.: X96 mini+

Brand Name: N/A

FCC ID: 2A16D-X96MINI

47 CFR Part 15, Subpart E

Standards: KDB 789033 D02 General UNII Test Procedures New Rules v02
KDB 558074 D01 Meas Guidance v05

Date of Test: Jan. 04, 2021 – Jan. 31, 2021

Date of Issue: Jan. 31, 2021

Test Result : **PASS**

Tested By:

Jun Li

(Jun Li)

Reviewed By:

Ares Liu

(Ares Liu)

Approved By:

Sheek Luo

(Sheek Luo)



* 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
CQASZ20210100002EX-02	Rev.01	Initial report	Jan. 31, 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.

3 Contents

	Page
1 VERSION	2
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	5
4.1 CLIENT INFORMATION	5
4.2 GENERAL DESCRIPTION OF EUT	5
4.3 TEST ENVIRONMENT AND MODE	7
4.4 DESCRIPTION OF SUPPORT UNITS	9
4.5 TEST LOCATION	9
4.6 TEST FACILITY.....	9
4.7 STATEMENT OF THE MEASUREMENT UNCERTAINTY	10
4.8 DEVIATION FROM STANDARDS	10
4.9 ABNORMALITIES FROM STANDARD CONDITIONS.....	10
4.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	11
4.11 EQUIPMENT LIST.....	11
5 TEST RESULTS AND MEASUREMENT DATA	12
5.1 ANTENNA REQUIREMENT	12
5.2 CONDUCTED EMISSIONS.....	13
5.3 CONDUCTED AVERAGE OUTPUT POWER.....	15
5.4 26DB BANDWIDTH	17
5.5 6DB BANDWIDTH.....	23
5.6 POWER SPECTRAL DENSITY.....	29
5.7 FREQUENCY STABILITY.....	40
5.8 RADIATED SPURIOUS EMISSIONS.....	49
5.8.1 Radiated emission below 1GHz	51
5.8.2 Transmitter emission above 1GHz.....	52
5.9 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY.....	61
6 PHOTOGRAPHS - EUT TEST SETUP	68
7 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS.....	70

4 General Information

4.1 Client Information

Applicant:	Zhejiang Xunshi Technology Co., Ltd
Address of Applicant:	4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China
Manufacturer:	Zhejiang Xunshi Technology Co., Ltd
Address of Manufacturer:	4th Floor, No.2 Qihang Building, Science and Technology Park, No.586 Xihuan Road, Shaoxing, Zhejiang, China

4.2 General Description of EUT

Product Name:	Set Top Box
Test Model No.:	X96 mini+
Trade Mark:	/
Hardware version:	V1.0
Software version:	V1.0
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:	<input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location
Antenna Type:	IPEX Antenna
Antenna Gain:	0dBi
Power Supply:	DC 5V from adapter
Adapter Information:	AC/DC ADAPTER MODEL:TSL-1681 INPUT:110-240V AC 50/60Hz 0.3A OUTPUT: DC 5v 2A

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: ANT1 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-40
Data Rate (Mbps)	DSSS/1Mbps	OFDM/13.5Mbps
Mode	2.4GWIFI-802.11b	UNII-AC40

Note: The test data for the worst mode of radiation emission has been recorded in the report: CQASZ20210100002EX-01

4.3 Test Environment and Mode

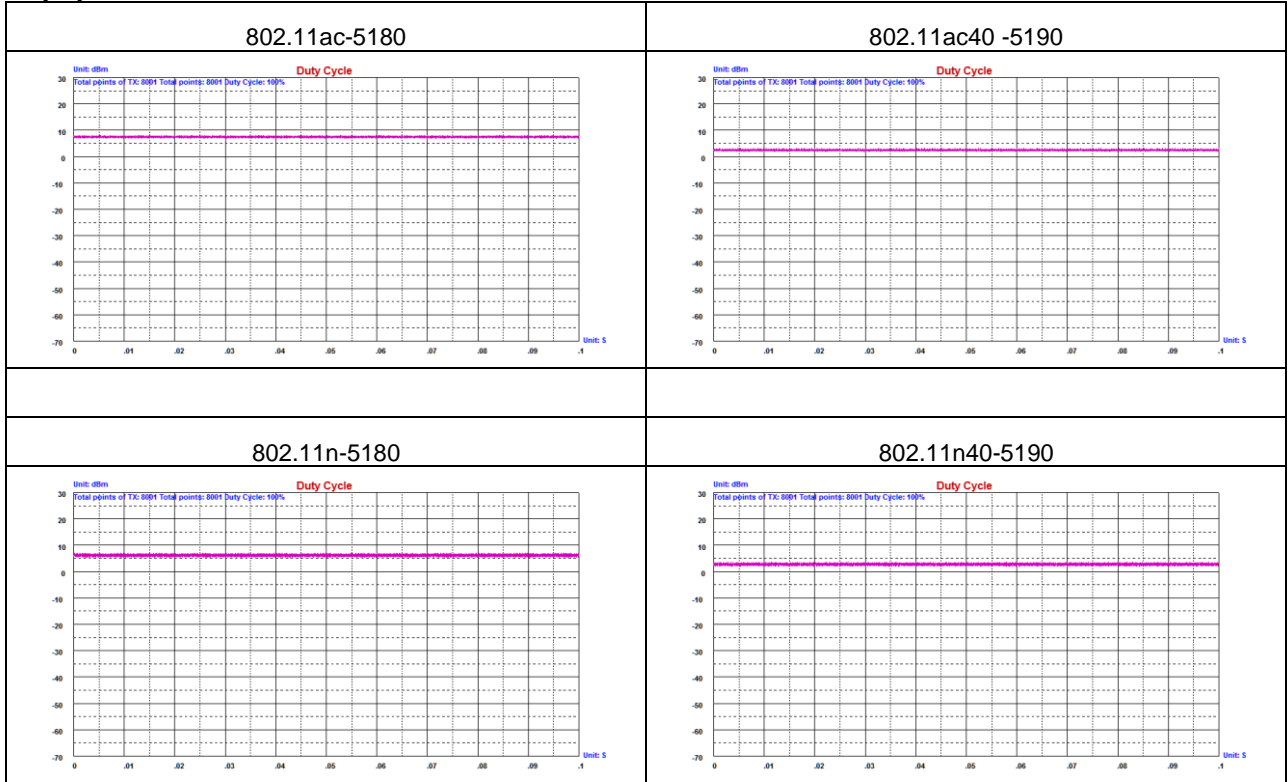
Operating Environment:		
Conduction emission		
Temperature:	23 °C	
Humidity:	51 % RH	
Atmospheric Pressure:	992mbar	
Radiated Emission (Normal Conditions)		
Temperature:	25.1 °C~25.5 °C	
Humidity:	51 % RH~55 % RH	
Atmospheric Pressure:	992mbar	
RF item test (RF test room Normal Conditions)		
Temperature:	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
<p>Remark:</p> <p>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.</p> <p>VN: Normal Voltage; TN: Normal Temperature;</p> <p>TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;</p> <p>VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.</p>		

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:



4.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
AC/DC ADAPTER	/	MODEL:TSL-1681 INPUT:110-240V AC 50/60Hz 0.3A OUTPUT: DC 5v 2A	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°C	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequenc 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 signaling 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

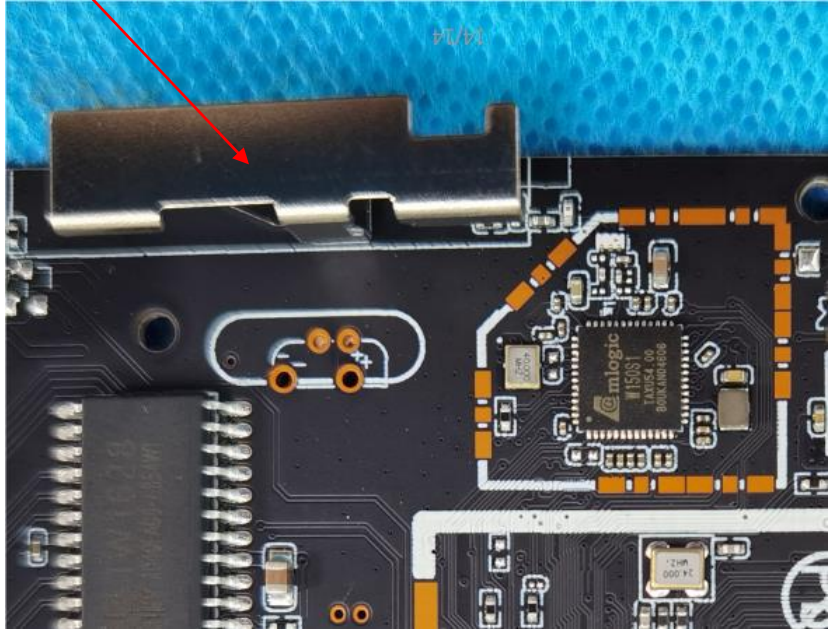
Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2020/9/22	2021/9/21
Spectrum analyzer	R&S	FSU26	CQA-038	2020/10/24	2021/10/23
Spectrum analyzer	keysight	N9020A	CQA-105	2020/10/24	2021/10/23
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2020/9/22	2021/9/21
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2020/11/2	2021/11/1
Loop antenna	Schwarzbeck	FMZB1516	CQA-087	2019/10/28	2021/10/27
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:

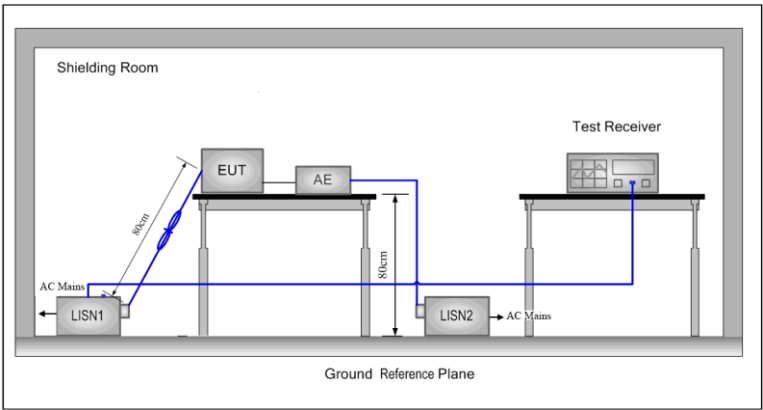
The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /407
<p>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.</p> <p>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.</p>	
EUT Antenna:	<p>Antenna</p> 
<p>The antenna is IFIA Antenna. The best case gain of the antenna is 0dBi.</p>	

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:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	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
	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:	<ol style="list-style-type: none"> 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 $50\Omega/50\mu\text{H} + 5\Omega$ 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

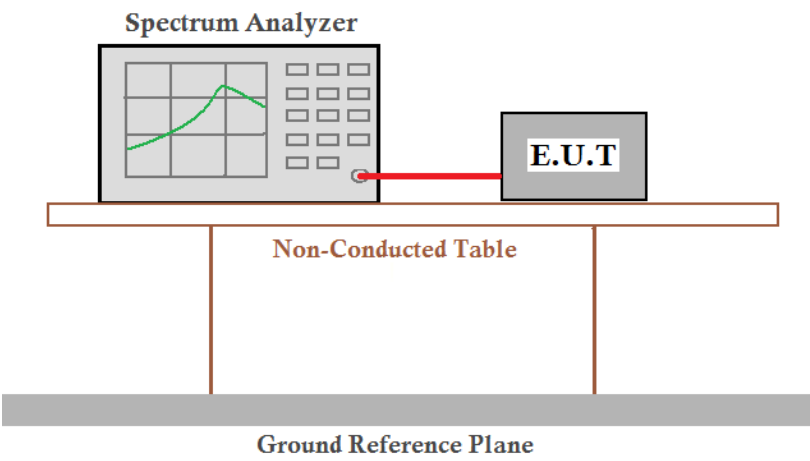
5.3 Conducted Average Output Power

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:	 <pre> graph LR EUT[EUT] --- PM[Power Meter] </pre>	
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	9.01	0	9.01	24.00	PASS
11N20	5200	8.94	0	8.94	24.00	PASS
11N20	5240	8.07	0	8.07	24.00	PASS
11N20	5745	3.37	0	3.37	30.00	PASS
11N20	5785	3.83	0	3.83	30.00	PASS
11N20	5825	3.12	0	3.12	30.00	PASS
11N40	5190	10.36	0	10.36	24.00	PASS
11N40	5230	10.18	0	10.18	24.00	PASS
11N40	5755	3.35	0	3.35	30.00	PASS
11N40	5795	2.99	0	2.99	30.00	PASS
11AC20	5180	9.21	0	9.21	24.00	PASS
11AC20	5200	10.34	0	10.34	24.00	PASS
11AC20	5240	9.68	0	9.68	24.00	PASS
11AC20	5745	2.67	0	2.67	30.00	PASS
11AC20	5785	2.83	0	2.83	30.00	PASS
11AC20	5825	2.26	0	2.26	30.00	PASS
11AC40	5190	10.70	0	10.70	24.00	PASS
11AC40	5230	10.51	0	10.51	24.00	PASS
11AC40	5755	2.81	0	2.81	30.00	PASS
11AC40	5795	2.83	0	2.83	30.00	PASS

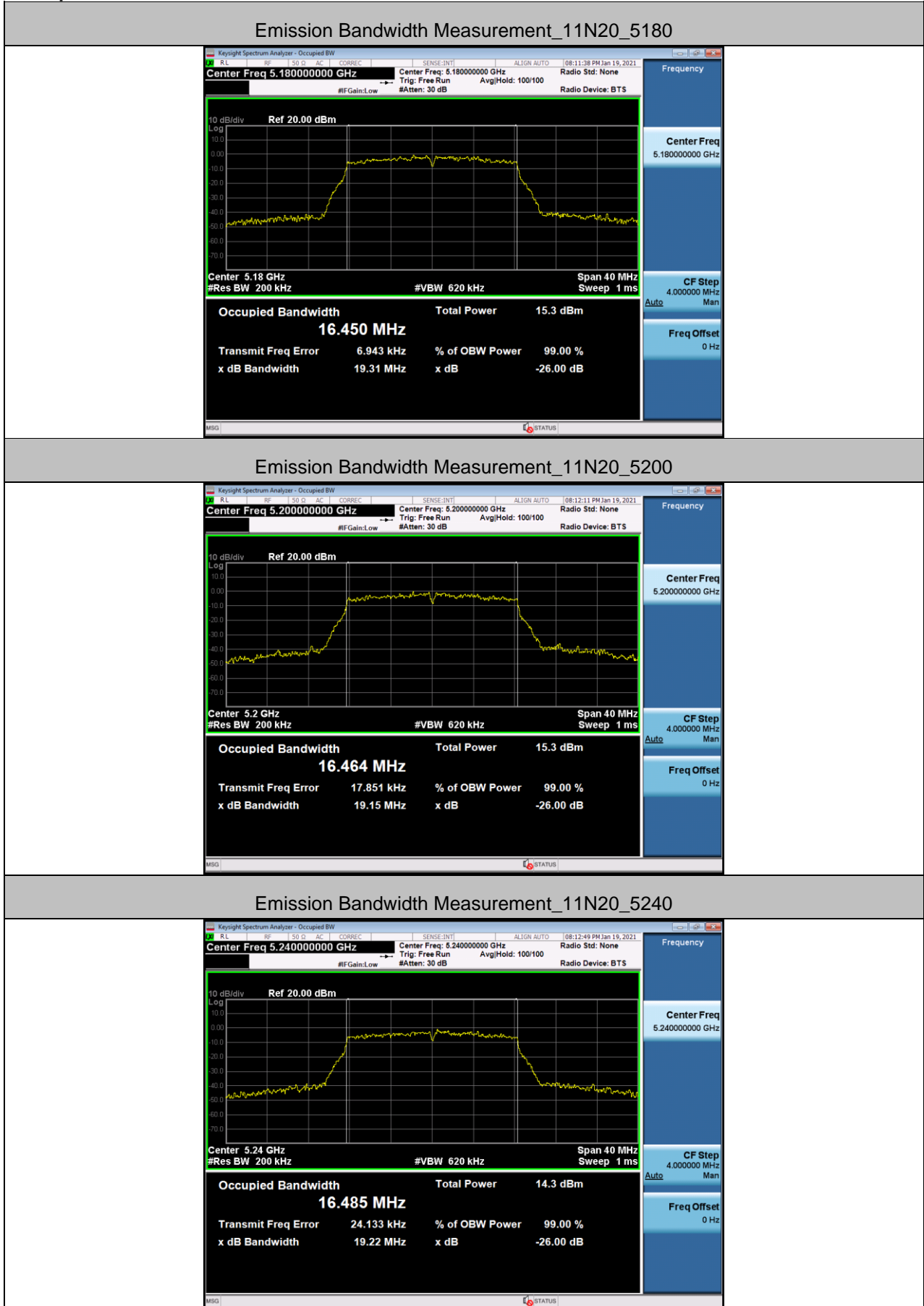
5.4 26dB Bandwidth

Test Requirement:	FCC 47 CFR Part 15 Subpart E Section 15.407 (a)
Test Method:	KDB 789033 D02 v02r01 Section C.1
Test Setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which sits on a Ground Reference Plane.</p>
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

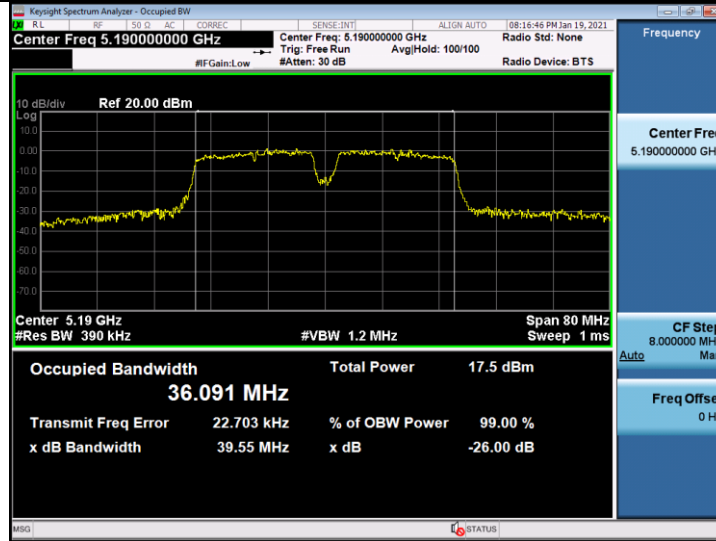
Measurement Data

Test Mode	Test Channel	EBW[MHz]	Limit[MHz]	Verdict
11N20	5180	19.31	---	PASS
11N20	5200	19.15	---	PASS
11N20	5240	19.22	---	PASS
11N40	5190	39.55	---	PASS
11N40	5230	39.25	---	PASS
11AC20	5180	19.38	---	PASS
11AC20	5200	19.10	---	PASS
11AC20	5240	19.52	---	PASS
11AC40	5190	39.01	---	PASS
11AC40	5230	39.40	---	PASS

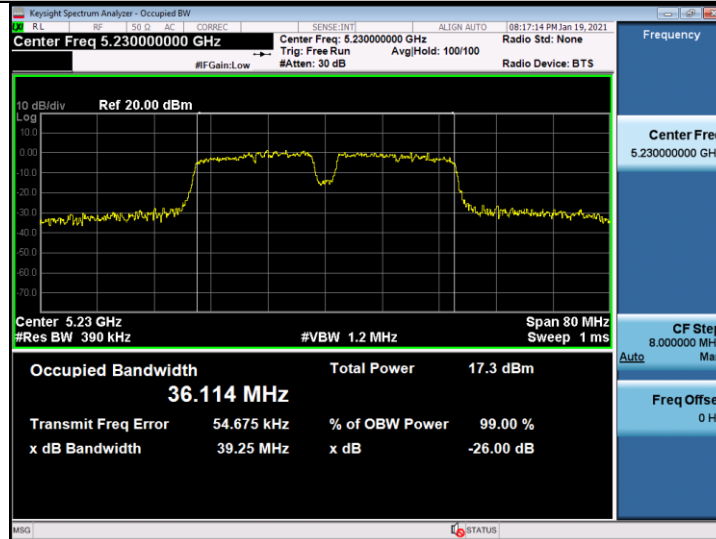
Test plot as follows:



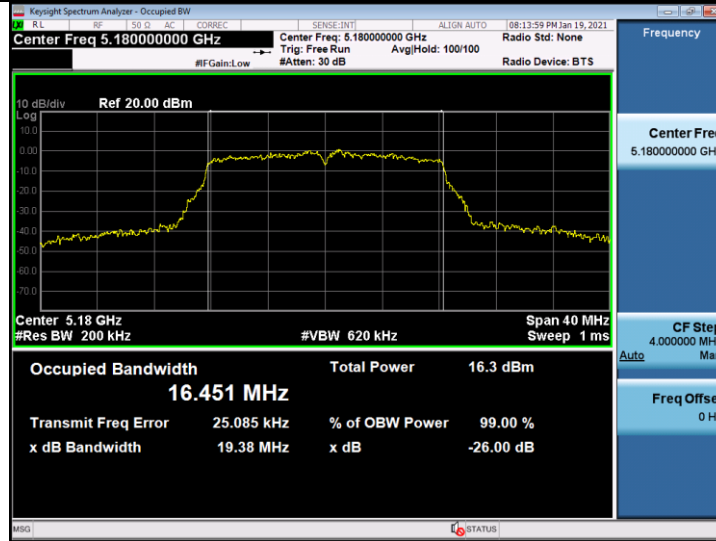
Emission Bandwidth Measurement_11N40_5190



Emission Bandwidth Measurement_11N40_5230



Emission Bandwidth Measurement_11AC20_5180



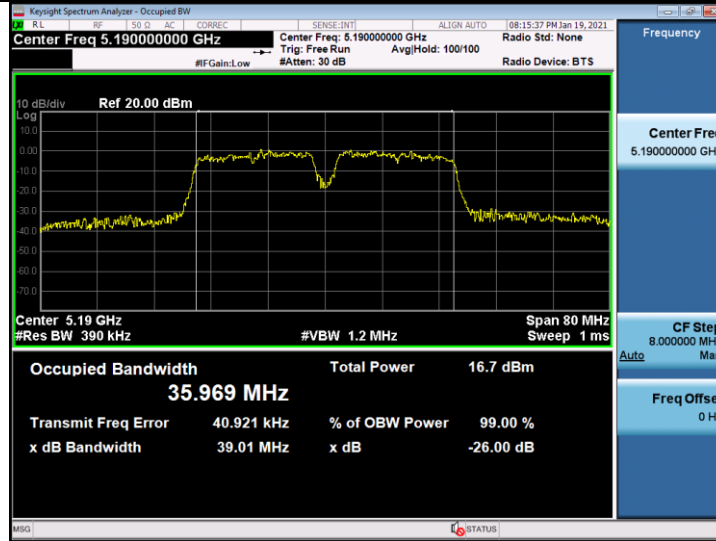
Emission Bandwidth Measurement_11AC20_5200



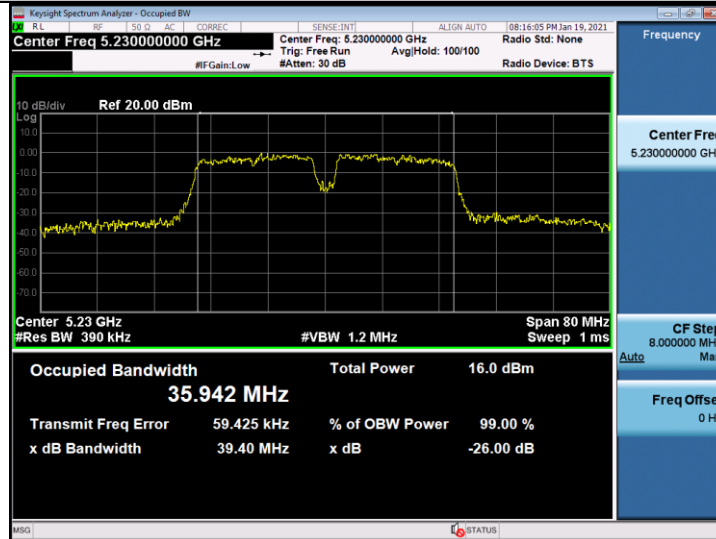
Emission Bandwidth Measurement_11AC20_5240



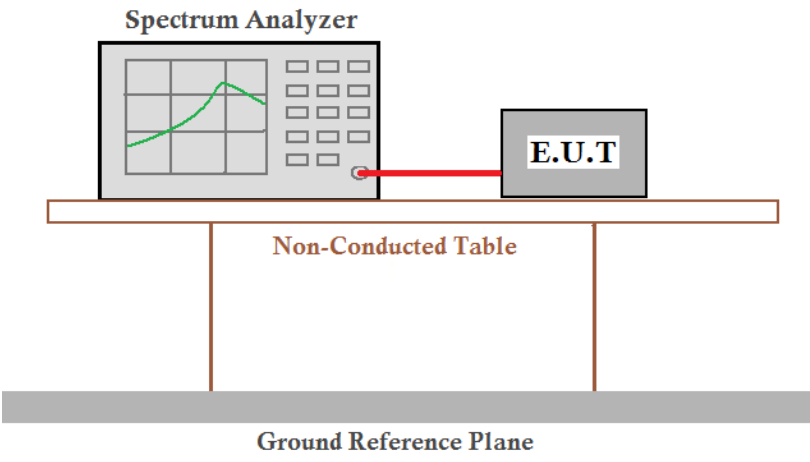
Emission Bandwidth Measurement_11AC40_5190



Emission Bandwidth Measurement_11AC40_5230



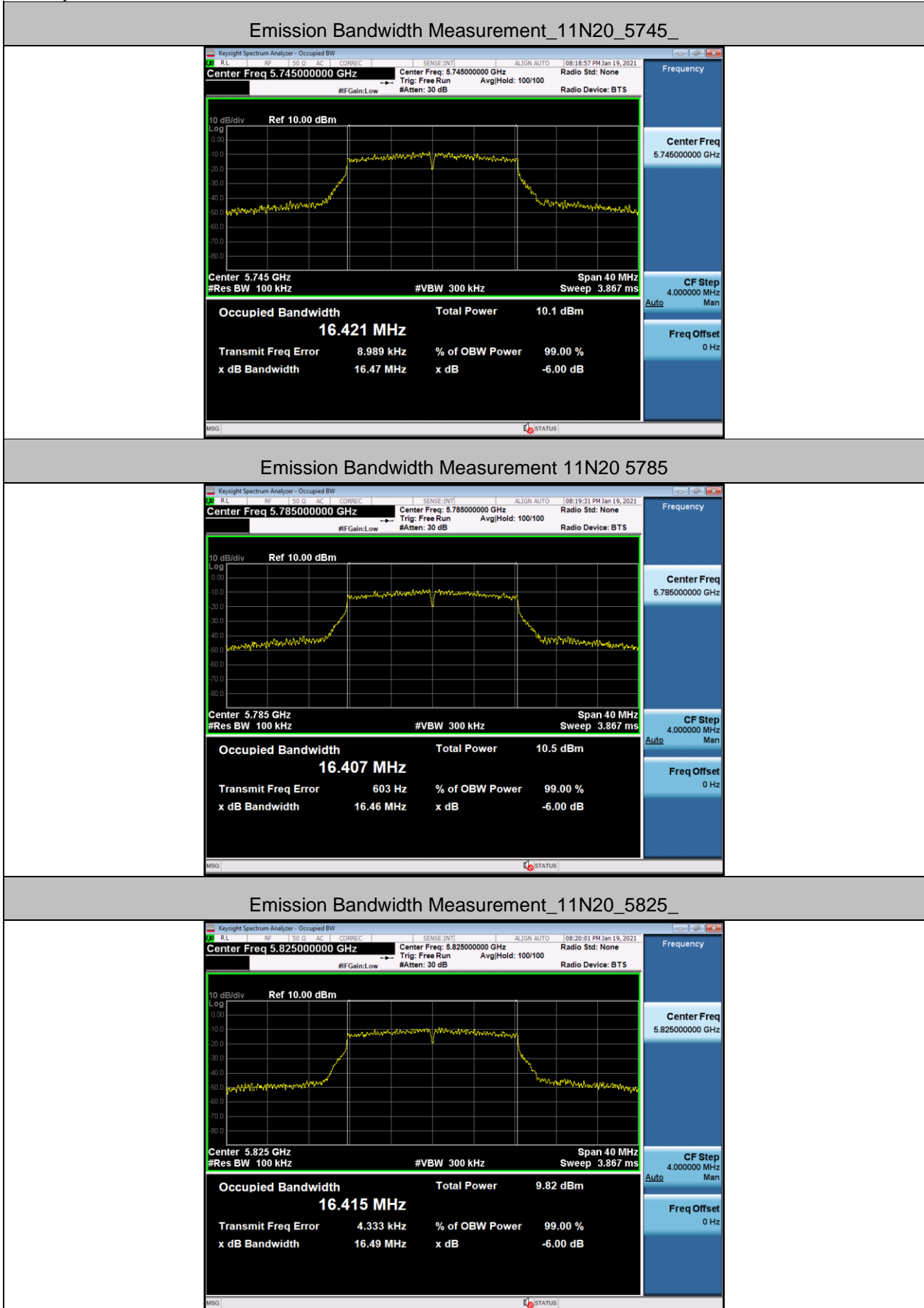
5.5 6dB Bandwidth

Test Requirement:	FCC 47 CFR Part 15 Subpart C Section 15.407 (e)
Test Method:	KDB 789033 D02 v02r01Section C.2
Test Setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
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	16.47	0.5	PASS
11N20	5785	Ant1	16.46	0.5	PASS
11N20	5825	Ant1	16.49	0.5	PASS
11N40	5755	Ant1	36.31	0.5	PASS
11N40	5795	Ant1	36.38	0.5	PASS
11AC20	5745	Ant1	16.37	0.5	PASS
11AC20	5785	Ant1	16.42	0.5	PASS
11AC20	5825	Ant1	16.40	0.5	PASS
11AC40	5755	Ant1	36.34	0.5	PASS
11AC40	5795	Ant1	36.37	0.5	PASS

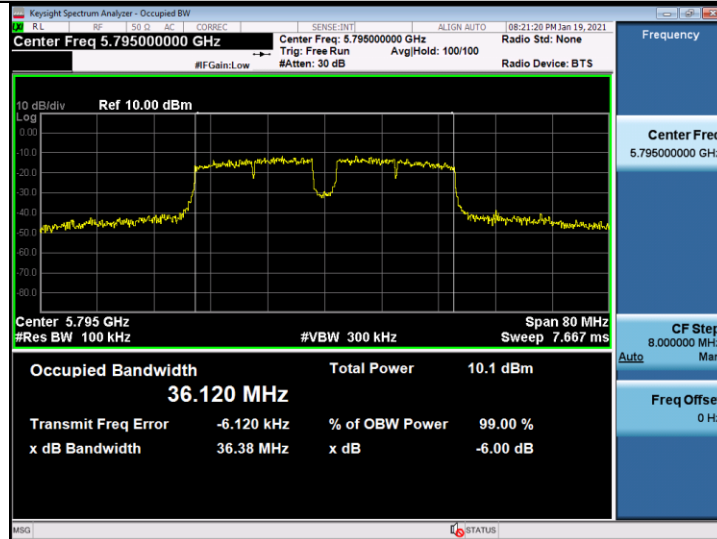
Test plot as follows:



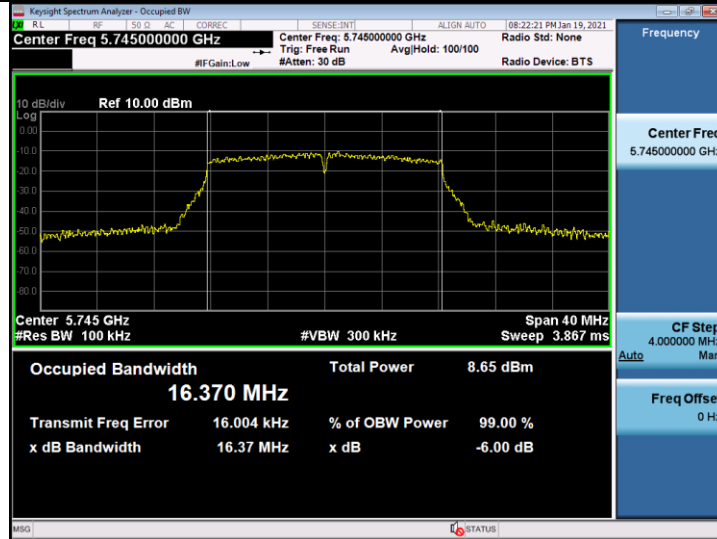
Emission Bandwidth Measurement 11N40 5755



Emission Bandwidth Measurement_11N40_5795



Emission Bandwidth Measurement_11AC20_5745



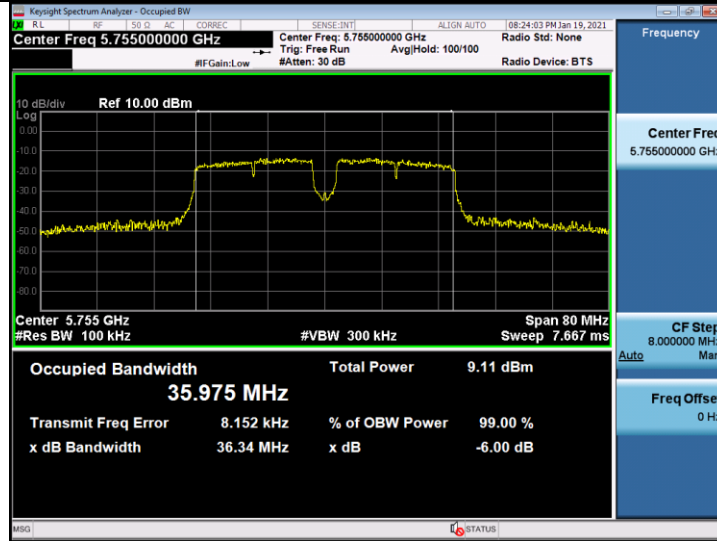
Emission Bandwidth Measurement_11AC20_5785



Emission Bandwidth Measurement_11AC20_5825



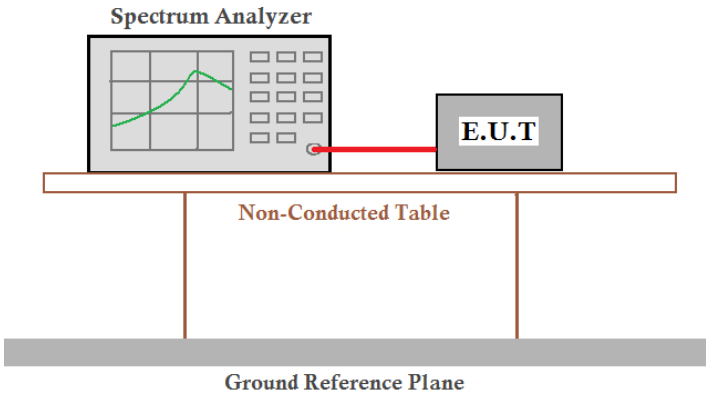
Emission Bandwidth Measurement 11AC40 5755



Emission Bandwidth Measurement_11AC40_5795



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:	 <p style="text-align: center;"><i>Remark:</i> <i>Offset the High-Frequency cable loss in the spectrum analyzer.</i></p>	
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	7.569	0	7.569	11.00	PASS
11N20	5200	7.015	0	7.015	11.00	PASS
11N20	5240	6.177	0	6.177	11.00	PASS
11N40	5190	4.95	0	4.95	11.00	PASS
11N40	5230	4.381	0	4.381	11.00	PASS
11AC20	5180	7.962	0	7.962	11.00	PASS
11AC20	5200	6.901	0	6.901	11.00	PASS
11AC20	5240	6.196	0	6.196	11.00	PASS
11AC40	5190	5.561	0	5.561	11.00	PASS
11AC40	5230	5.644	0	5.644	11.00	PASS

Remark:

PSD = Meas PSD + Duty Cycle Factor

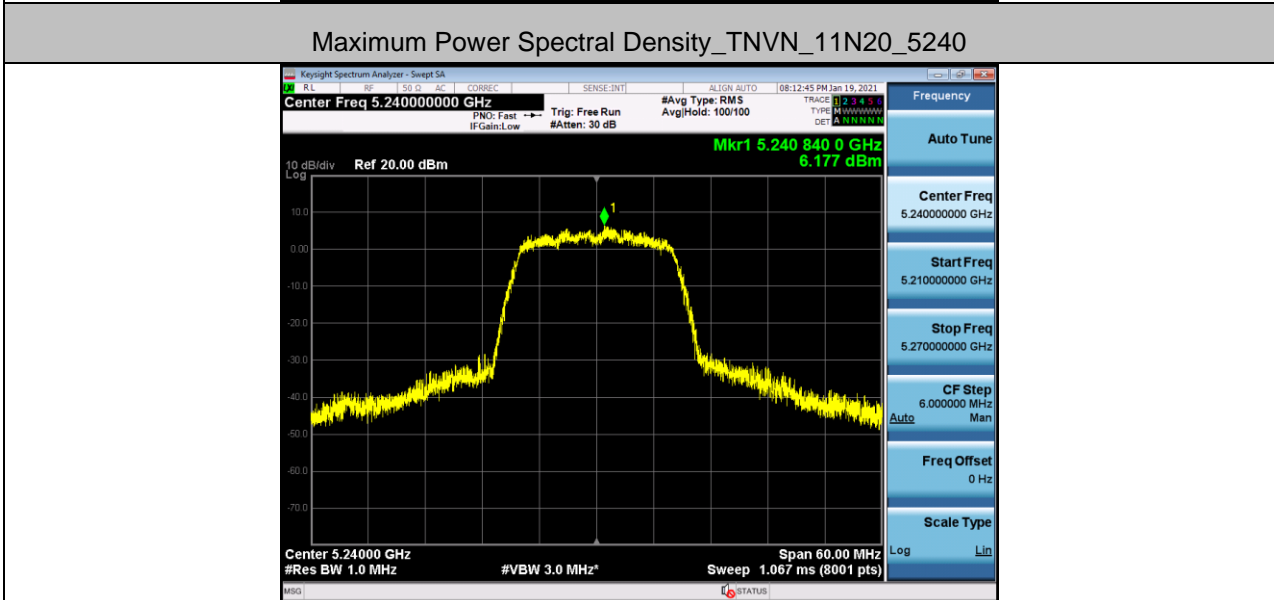
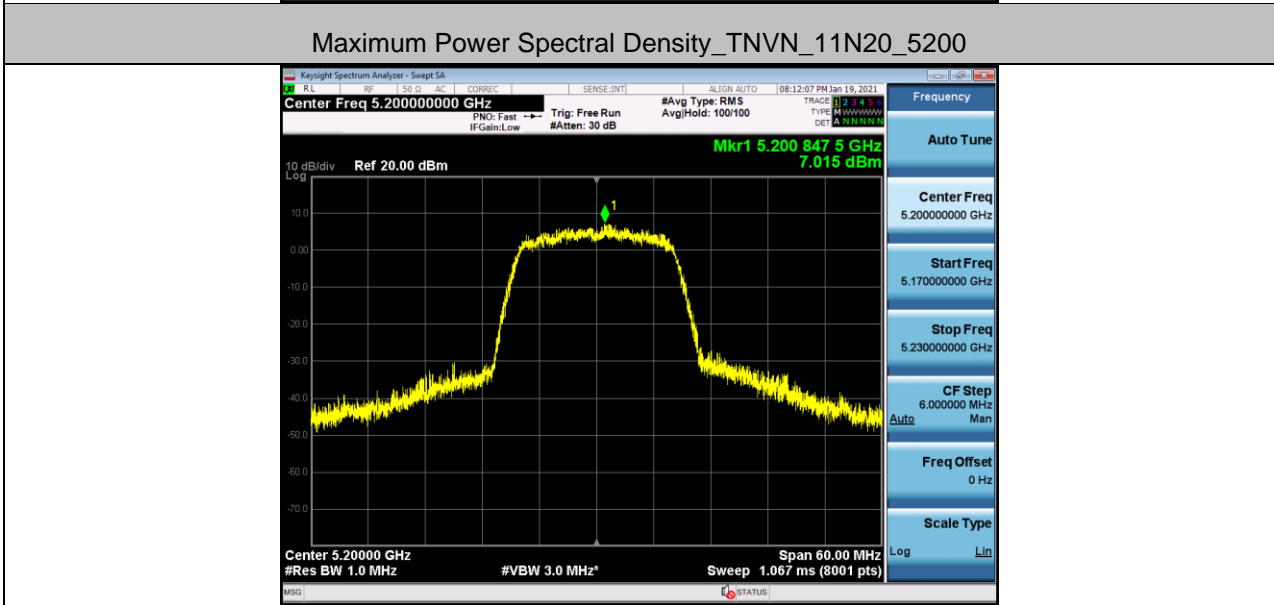
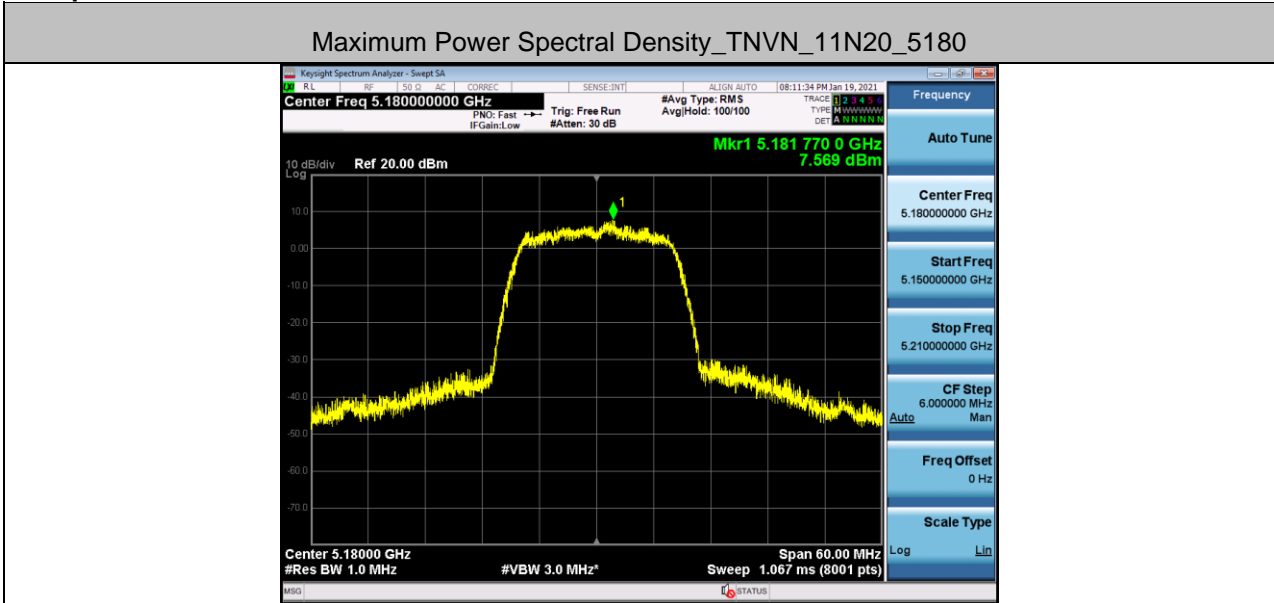
For U-NII-3 Band:

Test Mode	Test Channel	Meas PSD [dBm/500kHz]	Duty Cycle Factor [dB]	PSD [dBm/500kHz]	Limit [dBm/500kHz]	Verdict
11N20	5745	-1.343	0	-1.343	30.00	PASS
11N20	5785	-1.895	0	-1.895	30.00	PASS
11N20	5825	-1.604	0	-1.604	30.00	PASS
11N40	5755	-4.9	0	-4.9	30.00	PASS
11N40	5795	-5.685	0	-5.685	30.00	PASS
11AC20	5745	-2.389	0	-2.389	30.00	PASS
11AC20	5785	-2.629	0	-2.629	30.00	PASS
11AC20	5825	-4.003	0	-4.003	30.00	PASS
11AC40	5755	-5.313	0	-5.313	30.00	PASS
11AC40	5795	-5.34	0	-5.34	30.00	PASS

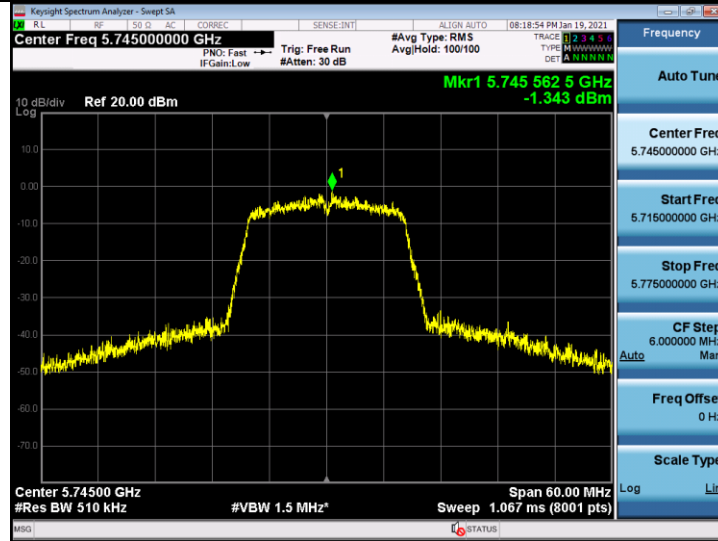
Remark:

PSD = Meas PSD + Duty Cycle Factor

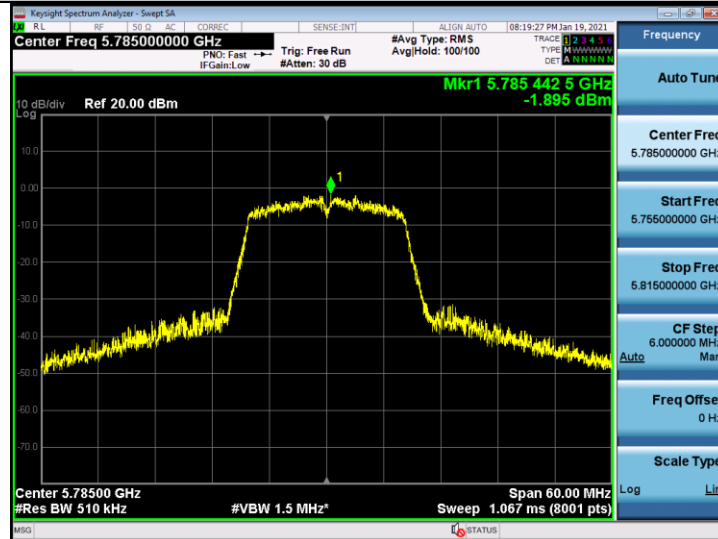
Test plot as follows:



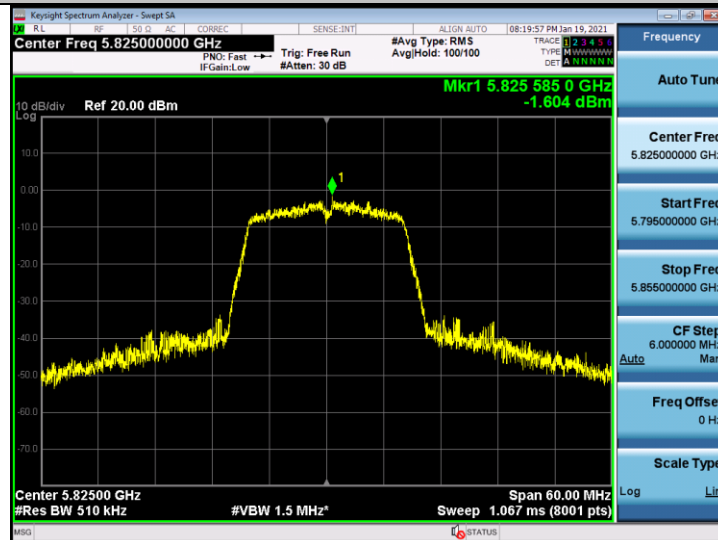
Maximum Power Spectral Density_TNVN_11N20_5745



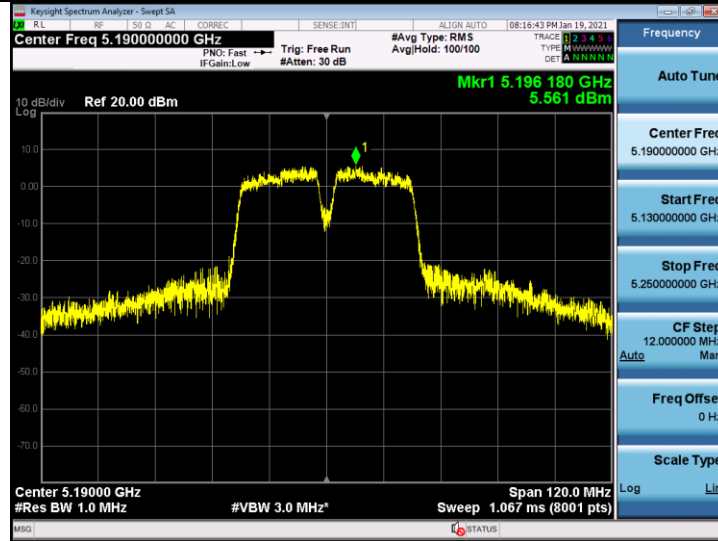
Maximum Power Spectral Density_TNVN_11N20_5785



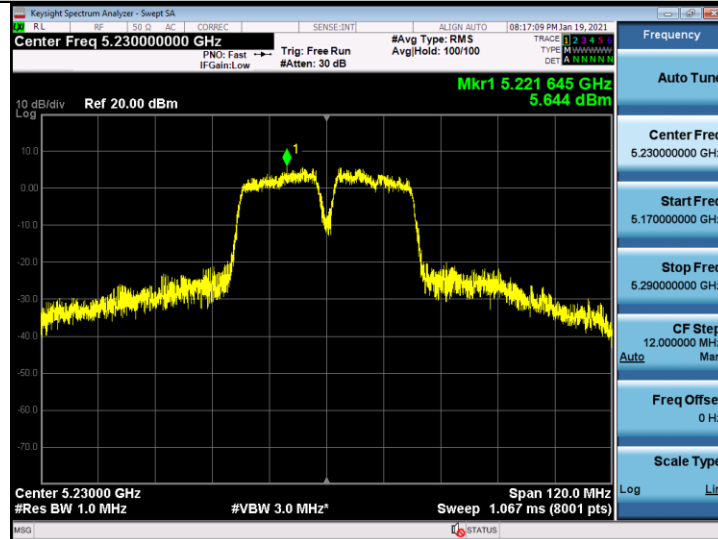
Maximum Power Spectral Density_TNVN_11N20_5825



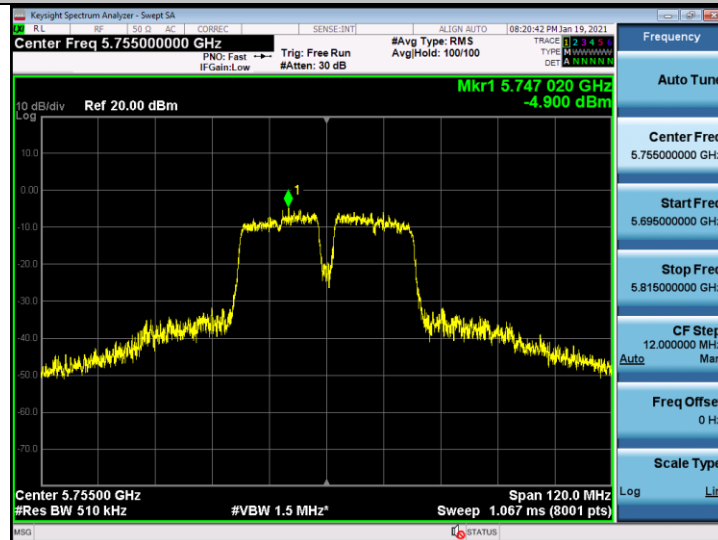
Maximum Power Spectral Density_TNVN_11N40_5190



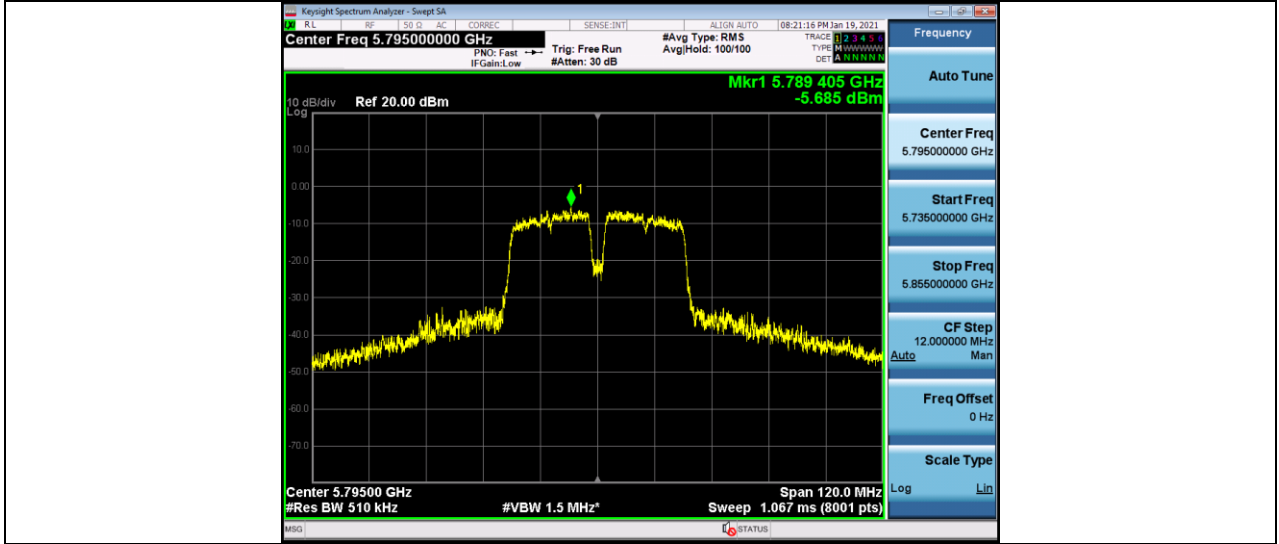
Maximum Power Spectral Density_TNVN_11N40_5230



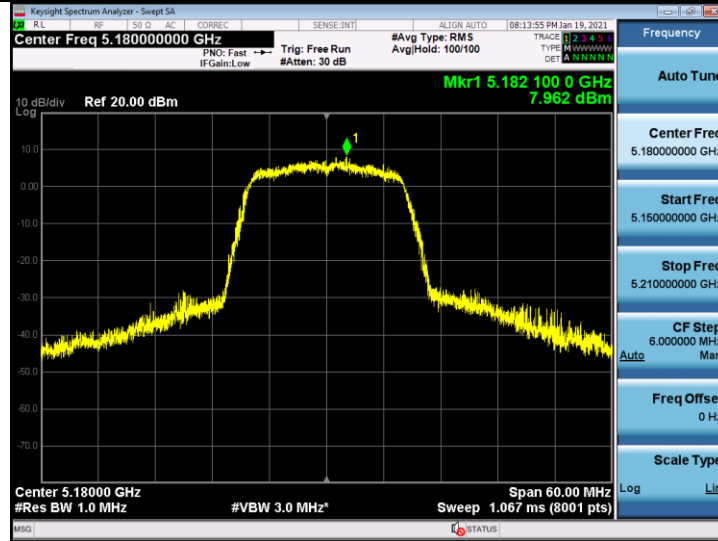
Maximum Power Spectral Density_TNVN_11N40_5755



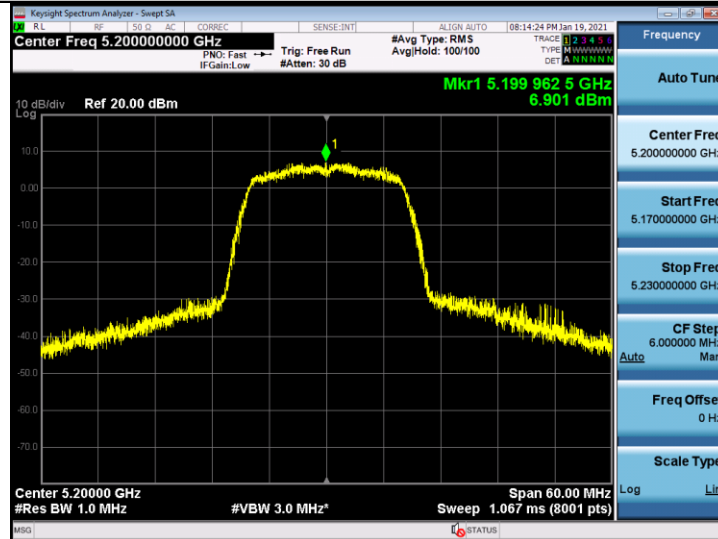
Maximum Power Spectral Density_TNVN_11N40_5795_



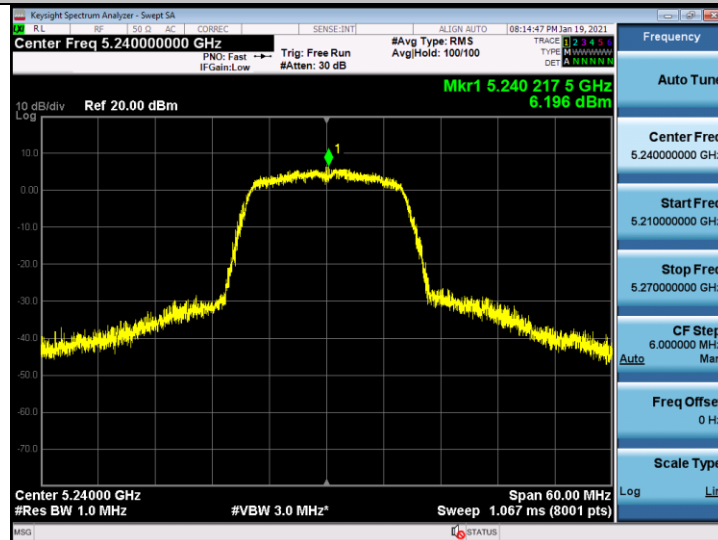
Maximum Power Spectral Density_TNVN_11AC20_5180



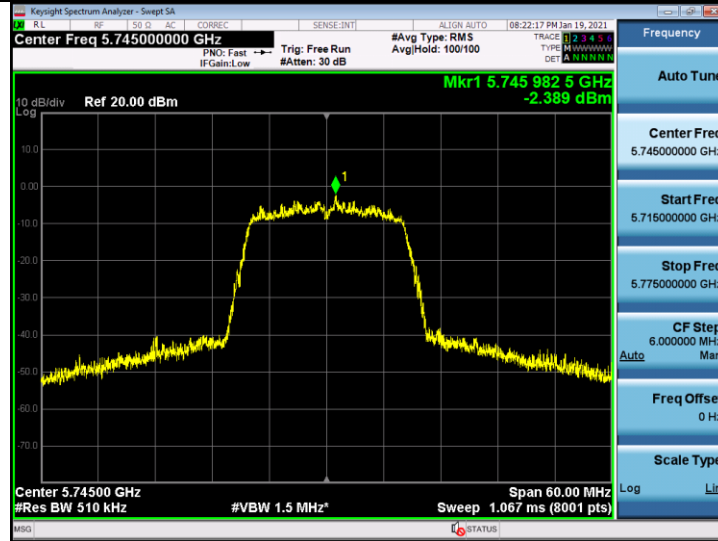
Maximum Power Spectral Density_TNVN_11AC20_5200



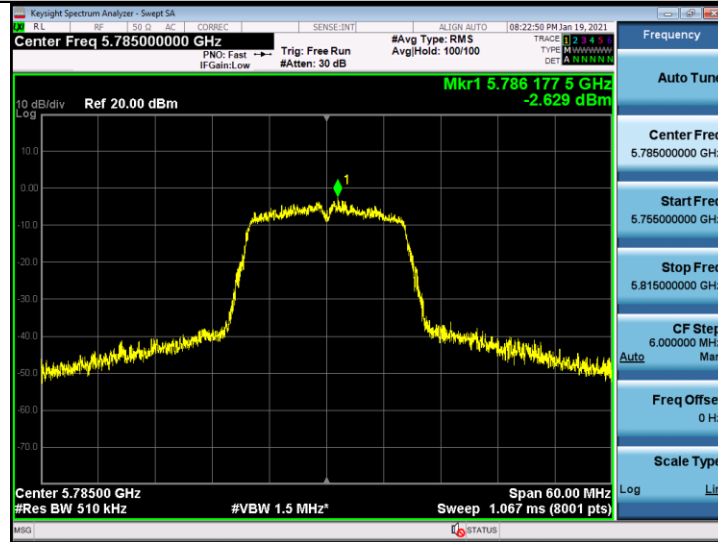
Maximum Power Spectral Density_TNVN_11AC20_5240



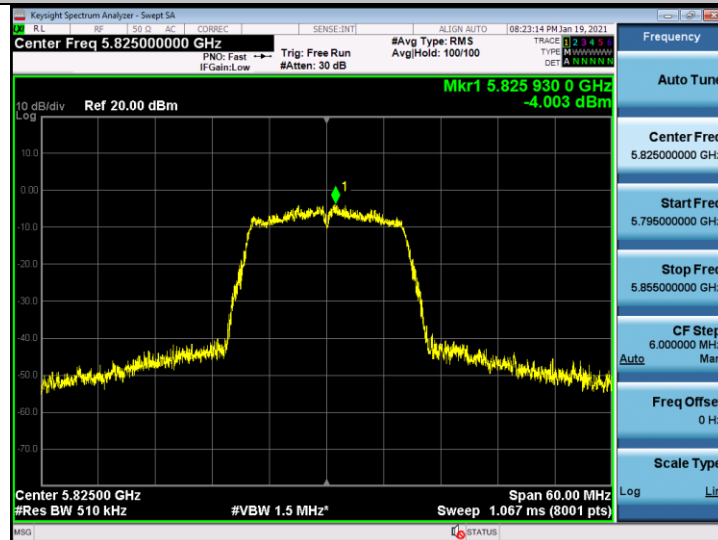
Maximum Power Spectral Density_TNVN_11AC20_5745



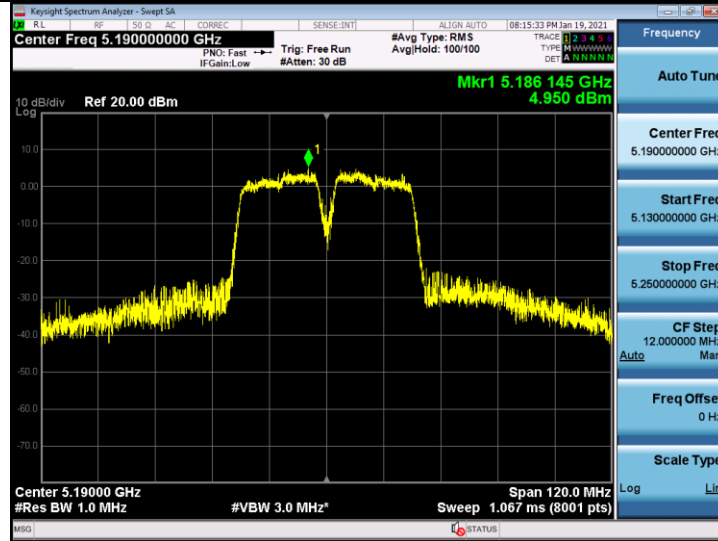
Maximum Power Spectral Density_TNVN_11AC20_5785_



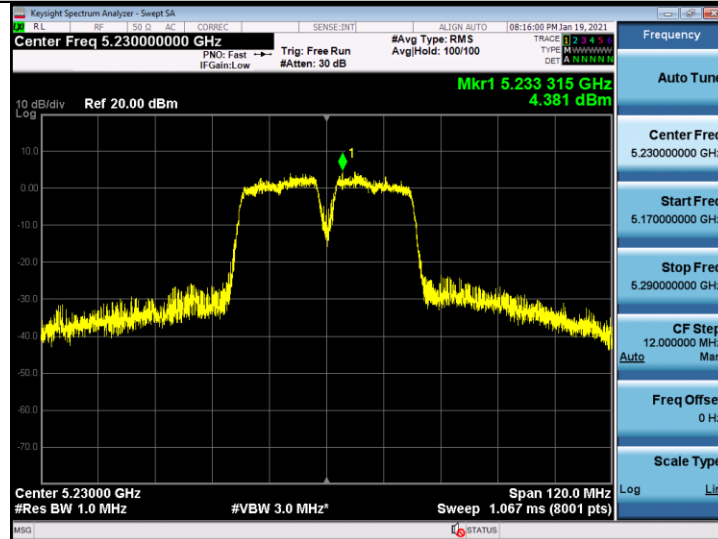
Maximum Power Spectral Density_TNVN_11AC20_5825



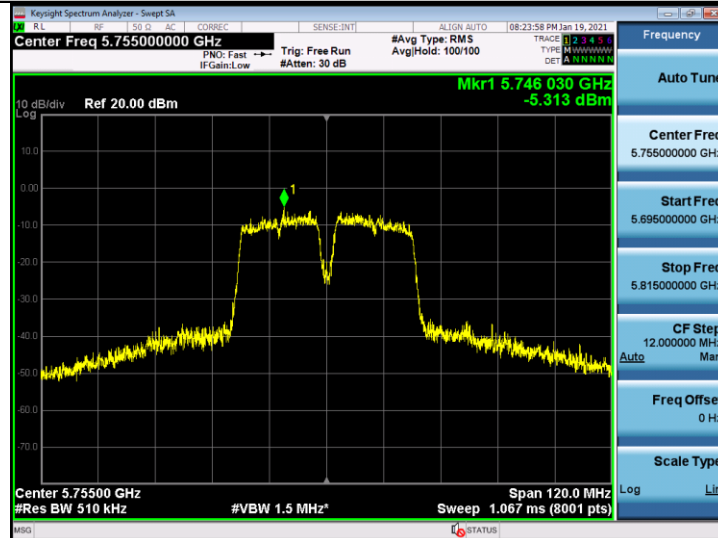
Maximum Power Spectral Density_TNVN_11AC40_5190



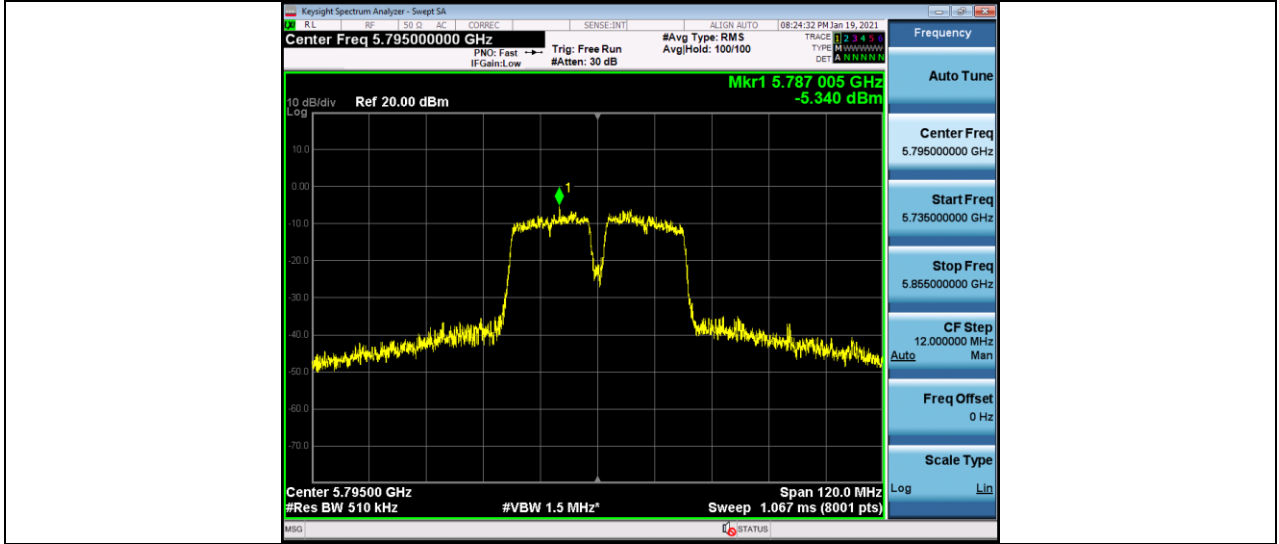
Maximum Power Spectral Density_TNVN_11AC40_5230



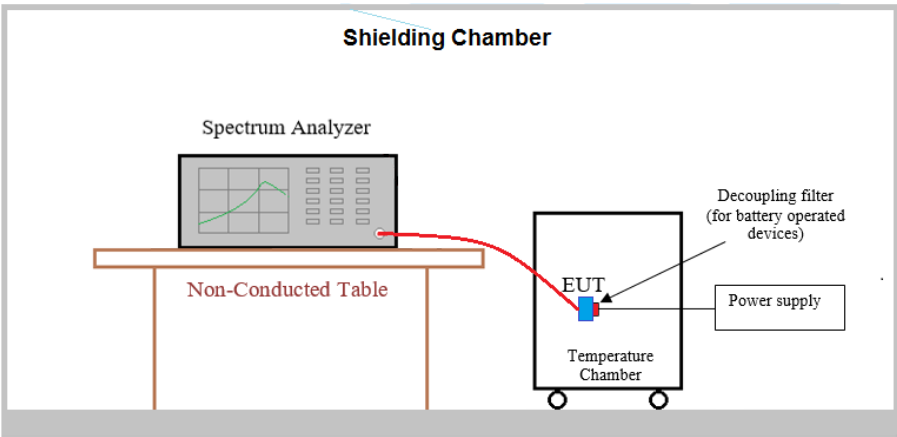
SMaximum Power Spectral Density_TNVN_11AC40_5755



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:	 <p><i>Remark:</i> <i>Offset the High-Frequency cable loss in the spectrum analyzer.</i></p>
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	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5180.036	7.037
40		5180.034	6.486
30		5180.032	6.141
20		5180.019	3.650
10		5180.010	1.949
0		5180.020	3.832
-10		5180.016	3.002
-20		5180.013	2.462

802.11n20--5200 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5200.018	3.498
40		5200.005	1.047
30		5200.020	3.762
20		5200.037	7.143
10		5200.004	0.752
0		5200.035	6.726
-10		5200.008	1.532
-20		5200.008	1.616

802.11n20-- 5240 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5240.028	5.314
40		5240.027	5.203
30		5240.017	3.295
20		5240.002	0.366
10		5240.003	0.598
0		5240.003	0.576
-10		5240.006	1.153
-20		5240.010	1.830

802.11n40 -- 5190 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5190.028	5.473
40		5190.025	4.760
30		5190.028	5.365
20		5190.020	3.758
10		5190.032	6.103
0		5190.003	0.610
-10		5190.032	6.074
-20		5190.014	2.788

802.11n40 -- 5230 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5230.016	3.098
40		5230.034	6.447
30		5230.031	5.914
20		5230.003	0.659
10		5230.008	1.604
0		5230.016	3.031
-10		5230.009	1.786
-20		5230.012	2.210

802.11ac20--5180 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5180.000	0.072
40		5180.028	5.497
30		5180.015	2.970
20		5180.033	6.375
10		5180.009	1.763
0		5180.001	0.126
-10		5180.017	3.319
-20		5180.016	2.996

802.11ac20--5200 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5200.002	0.383
40		5200.034	6.459
30		5200.038	7.237
20		5200.036	6.847
10		5200.022	4.228
0		5200.023	4.357
-10		5200.000	0.086
-20		5200.012	2.371

802.11ac20-- 5240 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5240.032	6.187
40		5240.024	4.509
30		5240.036	6.805
20		5240.030	5.794
10		5240.016	3.105
0		5240.022	4.126
-10		5240.005	0.929
-20		5240.011	2.082

802.11ac40 -- 5190 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5190.011	2.058
40		5190.030	5.727
30		5190.019	3.630
20		5190.012	2.407
10		5190.023	4.387
0		5190.037	7.182
-10		5190.025	4.895
-20		5190.031	6.008

802.11ac40 -- 5230 MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5230.019	3.697
40		5230.033	6.319
30		5230.000	0.080
20		5230.008	1.578
10		5230.024	4.639
0		5230.016	3.101
-10		5230.033	6.326
-20		5230.001	0.119

802.11n20-- 5745MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5745.030	5.138
40		5745.018	3.198
30		5745.012	2.051
20		5745.016	2.783
10		5745.015	2.545
0		5745.030	5.291
-10		5745.004	0.763
-20		5745.011	1.987

802.11n20-- 5785MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5785.022	3.856
40		5785.004	0.730
30		5785.023	3.910
20		5785.023	3.936
10		5785.035	6.103
0		5785.029	5.019
-10		5785.026	4.433
-20		5785.024	4.191

802.11n20-- 5825MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5825.033	5.624
40		5825.025	4.343
30		5825.004	0.603
20		5825.017	2.975
10		5825.015	2.608
0		5825.029	5.003
-10		5825.024	4.127
-20		5825.002	0.303

802.11n40-- 5755MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5755.008	1.395
40		5755.013	2.199
30		5755.030	5.246
20		5755.002	0.427
10		5755.011	1.965
0		5755.037	6.389
-10		5755.006	1.014
-20		5755.012	2.064

802.11n40-- 5795MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5795.030	5.140
40		5795.029	5.021
30		5795.011	1.853
20		5795.009	1.497
10		5795.010	1.757
0		5795.021	3.636
-10		5795.012	2.121
-20		5795.033	5.637

802.11ac20-- 5745MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5745.005	0.893
40		5745.010	1.723
30		5745.022	3.890
20		5745.028	4.885
10		5745.037	6.453
0		5745.005	0.944
-10		5745.035	6.034
-20		5745.007	1.188

802.11ac20-- 5785MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5785.024	4.072
40		5785.013	2.165
30		5785.035	6.006
20		5785.012	2.125
10		5785.004	0.751
0		5785.037	6.473
-10		5785.011	1.843
-20		5785.019	3.308

802.11ac20-- 5825MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5825.012	2.018
40		5825.012	2.023
30		5825.019	3.313
20		5825.016	2.815
10		5825.000	0.043
0		5825.022	3.758
-10		5825.017	2.916
-20		5825.029	5.018

802.11ac40-- 5755MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5755.003	0.481
40		5755.024	4.121
30		5755.031	5.372
20		5755.035	6.093
10		5755.024	4.090
0		5755.029	5.095
-10		5755.037	6.360
-20		5755.003	0.563

802.11ac40-- 5795MHz			
Temp	Voltage	Measured Frequency	Frequency Drift
(°C)		(MHz)	(ppm)
50	VN	5795.013	2.218
40		5795.015	2.560
30		5795.024	4.141
20		5795.015	2.601
10		5795.026	4.551
0		5795.028	4.882
-10		5795.024	4.223
-20		5795.009	1.478

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
<p>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.</p>					

Test Setup:

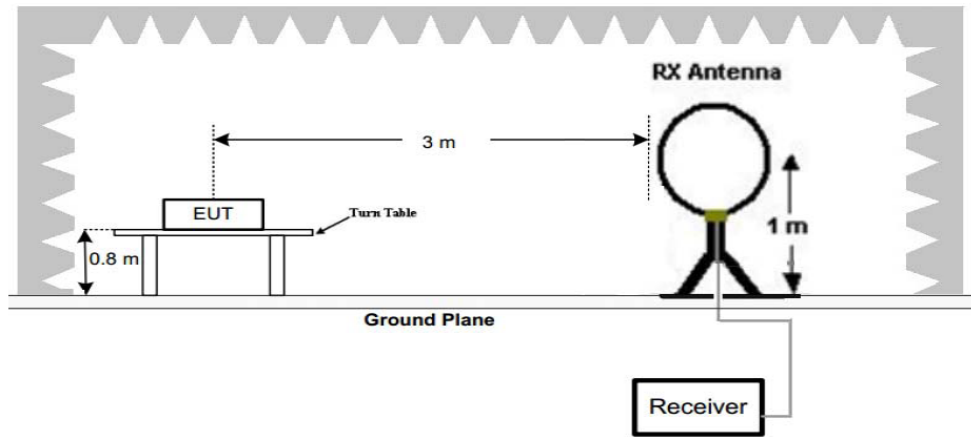


Figure 1. Below 30MHz

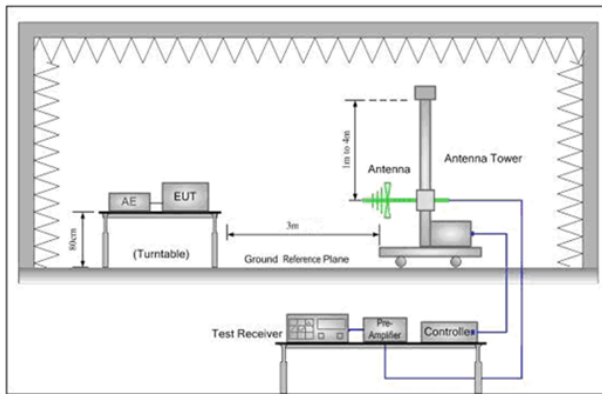


Figure 2. 30MHz to 1GHz

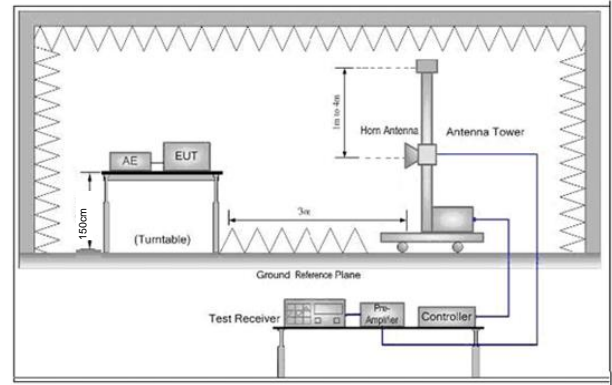


Figure 3. Above 1 GHz

<p>Test Procedure:</p>	<ol style="list-style-type: none"> 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 chamber. 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 chamber. The table was rotated 360 degrees to determine the position of the highest radiation. <p>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.</p> <ol style="list-style-type: none"> 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.
------------------------	---

	<p>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.</p> <p>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>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.</p> <p>g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel</p> <p>h. Repeat above procedures until all frequencies measured was complete.</p>
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. Worst case:
Test Results:	Pass

5.8.1 Radiated emission below 1GHz

The worst case is recorded in the report No.: CQASZ20210100002EX-01