FCC Test Report

Report No.: AGC01519240517FR02

FCC ID	:	IYA-H520DC
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Dash Camera
BRAND NAME	:	Pioneer
MODEL NAME	:	VREC-H520DC, VREC-H520DC-D
APPLICANT	:	Pioneer Electronics (USA) Inc.
DATE OF ISSUE	:	Jun. 26, 2024
STANDARD(S)	:	FCC Part 15 Subpart E §15.407
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 26, 2024	Valid	Initial Release

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1. General Information

Applicant	Pioneer Electronics (USA) Inc.
Address	970 West 190th Street, Suite 360, Torrance, California 90502, United States
Manufacturer	Pioneer India Electronics Private Limited
Address	Unit No: 3, 10th Floor, Ambience Corporate Tower-2 Plot No: 3, Ambience Island, NH-8 Gurugram, Haryana - 122002, India
Factory	APICAL VIETNAM TECHNOLOGY CO., LTD
Address	Lot E4, Thuan Thanh III Industrial Park, Subdivision B, Gia Dong Ward, Thuan Thanh Town, Bac Ninh Province, Vietnam
Product Designation	Dash Camera
Brand Name	Pioneer
Test Model	VREC-H520DC
Series Model(s)	VREC-H520DC-D
Difference Description	All the series models are the same as the test model except for the shell color.
Date of receipt of test item	May 30, 2024
Date of Test	May 30, 2024 – Jun. 26, 2024
Deviation from Standard	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Test Report Form No	AGCER-FCC-5G WLAN-V1

Note: The test results of this report relate only to the tested sample identified in this report.

Prepared By	Thea Huang Thea Huang (Project Engineer)	Jun. 26, 2024
Reviewed By	Calvin Liu Calvin Liu (Reviewer)	Jun. 26, 2024
Approved By	Max Zhang Max Zhang (Authorized Officer)	Jun. 26, 2024

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2. Product Information

2.1 Product Technical Description

Equipment Type	☐ Outdoor access points ☐ Indoor access points ☐ Fixed P2P access points ☒ Client devices
Operation Frequency	☒ U-NII 1:5150MHz~5250MHz ☐ U-NII 2A: 5250MHz~5350MHz ☐ U-NII 2C:5470MHz~5725MHz ☒ U-NII 3: 5725MHz~5850MHz
TPC Function	☐ Yes ☒ No
Hardware Version	CJ2031-MAIN-01A-03
Software Version	0.0.18
Test Frequency Range	For 802.11a:5180~5240MHz/5745~5825MHz; For 802.11n-HT20:5180~5240MHz/5745~5825MHz; For 802.11n-HT40: 5190~5230MHz/5755~5795MHz;
RF Output Power	802.11a:12.17dBm,802.11n(HT20):11.97dBm; 802.11n(HT40):11.97dBm
Modulation	802.11a/n:(64-QAM, 16-QAM, QPSK, BPSK) OFDM
Data Rate	802.11a:6/9/12/18/24/36/48/54Mbps; 802.11n: up to 300Mbps;
Number of channels	6 channels of U-NII1 Band; 7 channels of U- NII 3 Band
Antenna Designation	FPC Antenna
Antenna Gain	4.25dBi
Power Supply	DC 5V 2A by Car Charger
Car Charger information	Model name: CA01 Input: DC 12V-24V Output: DC 5V, 2A

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2.2 Table of Carrier Frequency

For 5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

For 5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20):

Channel	Frequency	Channel	Frequency
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz	--	--

2 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

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2.3 IEEE 802.11n Modulation Scheme

MCS Index	Nss	Modulation	R	N_{BPSC}	N_{CBPS}		N_{DBPS}		Data rate (Mbps) 800nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0
6	1	64-QAM	3/4	6	312	648	234	489	58.5	121.5
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	Guard interval

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2.4 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for FCC ID: IYA-H520DC filing to comply with the FCC Part 15 requirements.

2.5 Test Methodology

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 662911	662911 D01 Multiple Transmitter Output v02r01
5	KDB 789033	789033 D02 General U-NII Test Procedures New Rules v02r01

2.6 Special Accessories

Refer to section 4.4.

2.7 Equipment Modifications

Not available for this EUT intended for grant.

2.8 Antenna Requirement

Standard Requirement
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 antennathat uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a brokenantenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
EUT Antenna:
The non-detachable antenna inside the device cannot be replaced by the user at will. The gain of the antenna is 4.25dBi.

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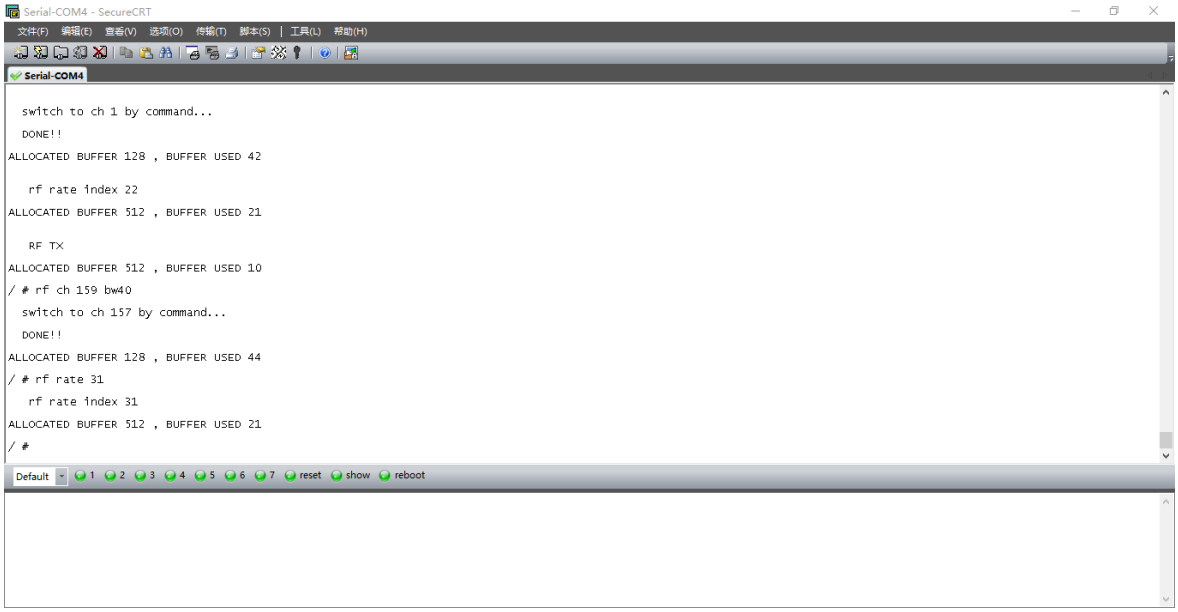
2.9 Description of Test Software

For IEEE 802.11 mode:

The test utility software used during testing was “SecureCRT”, and the version was “V1.0”.

Software Setting Diagram



U-NII 1		
Test Mode	Channel	Power Index
802.11a	L	56
802.11a	M/H	30
802.11n(HT20)	L/M/H	54
802.11n(HT40)	L/M/H	54
U-NII 3		
Test Mode	Channel	Power Index
802.11a	L/M/H	AB
802.11n(HT20)	L/M/H	AB
802.11n(HT40)	L/M/H	AB

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3. Test Environment

3.1 Address of The Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

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

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories.)

A2LA-Lab Cert. No.: 5054.02

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. 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 with Registration 975832.

IC-Registration No.: 24842 (CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.

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3.3 Environmental Conditions

	Normal Conditions
Temperature range (℃)	15 - 35
Relative humidity range	20% - 75%
Pressure range (kPa)	86 - 106
Power supply	DC 5V 2A by Car Charger

3.4 Measurement Uncertainty

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	U_c = ±2.9 dB
Uncertainty of Radiated Emission below 1GHz	U_c = ±3.9 dB
Uncertainty of Radiated Emission above 1GHz	U_c = ±4.9 dB
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2.7 %

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3.5 List of Equipment Used

● RF Conducted Test System							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☒	AGC-ER-E036	Spectrum Analyzer	Agilent	N9020A	MY49100060	2024-05-24	2025-05-23
☒	AGC-ER-E062	Power Sensor	Agilent	U2021XA	MY54110007	2024-02-01	2025-01-31
☒	AGC-ER-E063	Power Sensor	Agilent	U2021XA	MY54110009	2024-02-01	2025-01-31
☒	AGC-EM-A152	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-09-21	2025-09-20
☒	AGC-ER-E083	Signal Generator	Agilent	E4421B	US39340815	2024-05-23	2025-05-22
☒	N/A	RF Connection Cable	N/A	1#	N/A	Each time	N/A
☒	N/A	RF Connection Cable	N/A	2#	N/A	Each time	N/A

● Radiated Spurious Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☐	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2024v-02-01	2025-01-31
☒	AGC-EM-E116	EMI Test Receiver	R&S	ESCI	100034	2024-05-24	2025-05-23
☒	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2024-05-28	2025-05-27
☒	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2024-03-05	2026-03-04
☒	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10
☒	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2024-03-31	2025-03-30
☒	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2023-09-24	2025-09-23
☒	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2022-08-04	2024-08-03
☒	AGC-EM-A119	2.4G Filter	SongYi	N/A	N/A	2024-05-23	2025-05-22
☒	AGC-EM-A138	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08
☐	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08

● AC Power Line Conducted Emission							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
☐	AGC-EM-E045	EMI Test Receiver	R&S	ESPI	101206	2024-05-28	2025-05-27
☐	AGC-EM-A130	6dB Attenuator	Eeatsheep	LM-XX-6-5W	DC-6GZ	2023-06-09	2025-06-08
☐	AGC-EM-E023	AMN	R&S	100086	ESH2-Z5	2024-05-28	2025-05-27

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● Test Software					
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information
☐	AGC-EM-S001	CE Test System	R&S	ES-K1	V1.71
☒	AGC-EM-S003	RE Test System	FARA	EZ-EMC	VRA-03A
☒	AGC-ER-S012	BT/WIFI Test System	Tonscend	JS1120-2	2.6
☒	AGC-EM-S011	RSE Test System	Tonscend	TS+-Ver2.1(JS36-RSE)	4.0.0.0

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4.System Test Configuration

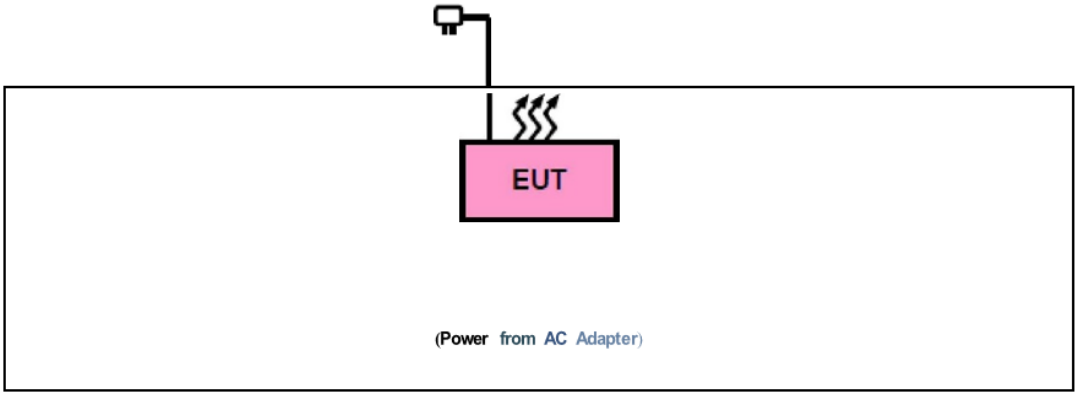
4.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

4.3 Configuration of Tested System



4.4 Equipment Used in Tested System

The following peripheral devices and interface cables were connected during the measurement:

☒ Test Accessories Come From The Laboratory

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	Control Box	--	USB-TTL		--
2	Car battery	--	SCOSCHE		--

☐ Test Accessories Come From The Manufacturer

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	--	--	--	--	--

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4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	§15.203	Antenna Equipment	Pass
2	§15.407(a/1/3)	RF Output Power	Pass
3	§15.407(e)	6 dB Bandwidth	Pass
4	§15.403(i)	99% Occupied Bandwidth	Pass
5	§15.407(a/1/3)	Power Spectral Density	Pass
6	§15.407(g)	Frequency Stability	Pass (See Note 1)
7	§15.407(c)	Transmission Discontinuation Requirement	Pass (See Note 2)
8	§15.407(b)(1/4)	Conducted Band Edge and Out-of-Band Emissions	Pass
9	§15.209,§15.407(b)(1/4)	Radiated Spurious Emission	Pass
10	§15.207	AC Power Line Conducted Emission	Not applicable

Note:

1. Refer to the manufacturer's declaration in the user manual.
2. The device operates without the transmission of information.
3. The conducted emission test at AC port are not required for devices which only employ DC Power for operation.

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5. Description of Test Modes

EUT Configure Mode	Applicable To				Description
	RE＞1G	RE＜1G	PLC	APCM	
A	--	--	--	--	Powered by Adapter with WIFI(5G) Link
B	☒	☒	--	☒	Powered by Battery with WIFI(5G) Link
C	--	--	--	--	Powered by USB with WIFI(5G) Link

Where, **RE＞1G: Radiated Emission above 1GHz** **PLC: Power Line Conducted Emission**

RE＜1G: Radiated Emission below 1GHz **APCM: Antenna Port Conducted Measurement**

NOTE 1: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.

NOTE 2: "--"means no effect.

- **Radiated Emission Test (Above 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations be Meen available modulations, data rates and antenna ports (IF EUT with antenna diversity architecture).

☐ Support 802.11ax, device debugging is tested in Full RU state

☐ The device under test has multiple antennas. The mode that supports MIMO technology records the worst data, and the mode that does not support MIMO technology records antenna 1 as the worst data.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Band (MHz)	Available Channel	Tested Channel	Modulation	Data Rate (Mbps)
A	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
A	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0

- **Radiated Emission Test (Below 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations be Meen available modulations, data rates and antenna ports (If EUT with antenna diversity architecture).

☐ The device under test has multiple antennas. The mode that supports MIMO technology records the worst data, and the mode that does not support MIMO technology records antenna 1 as the worst data.

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Band (MHz)	Available Channel	Tested Channel	Modulation	Data Rate (Mbps)
B	802.11a	5745-5825	149 to 165	165	OFDM	6.0

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- **Power Line Conducted Emission Test:**

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations be Meen available modulations, data rates and antenna ports (If EUT with antenna diversity architecture).
☐ The device under test has multiple antennas. The mode that supports MIMO technology records the worst data, and the mode that does not support MIMO technology records antenna 1 as the worst data.
☐ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Band (MHz)	Available Channel	Tested Channel	Modulation	Data Rate (Mbps)
B	802.11a	5745-5825	149 to 165	165	OFDM	6.0

- **Band edge Measurement:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations be Meen available modulations, data rates and antenna ports (If EUT with antenna diversity architecture).
☐ Support 802.11ax, device debugging is tested in Full RU state
☐ The device under test has multiple antennas. The mode that supports MIMO technology records the worst data, and the mode that does not support MIMO technology records antenna 1 as the worst data.
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Band (MHz)	Available Channel	Tested Channel	Modulation	Data Rate (Mbps)
A	802.11a	5180-5240	36 to 48	36	OFDM	6.0
A	802.11n (20MHz)		36 to 48	36	OFDM	MCS0
A	802.11n (40MHz)		38 to 46	38	OFDM	MCS0

- **Antenna Port Conducted Measurement:**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations be Meen available modulations, data rates and antenna ports (If EUT with antenna diversity architecture).

☐ Support 802.11ax, device debugging is tested in Full RU state

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Freq. Band (MHz)	Available Channel	Tested Channel	Modulation	Data Rate (Mbps)
B	802.11a	5180-5240	36 to 48	36, 40, 48	OFDM	6.0
B	802.11n (20MHz)		36 to 48	36, 40, 48	OFDM	MCS0
B	802.11n (40MHz)		38 to 46	38, 46	OFDM	MCS0
B	802.11a	5745-5825	149 to 165	149, 157, 165	OFDM	6.0
B	802.11n (20MHz)		149 to 165	149, 157, 165	OFDM	MCS0
B	802.11n (40MHz)		151 to 159	151, 159	OFDM	MCS0

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6. Duty Cycle Measurement

5GHz WLAN (NII) operation is possible in 20MHz, 40MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Average. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Operating mode	Data rates (Mbps)	Duty Cycle (%)	Duty Cycle Factor (dB)
Band U-NII1:5150MHz-5250MHz			
802.11a	6	98.72	0.06
802.11n_HT20	MCS0	98.68	0.06
802.11n_HT40	MCS0	97.36	0.12
Band U-NII 3: 5725MHz~5850MHz			
802.11a	6	95.34	0.21
802.11n_HT20	MCS0	98.68	0.06
802.11n_HT40	MCS0	97.32	0.12

Remark:

1. Duty Cycle factor = 10 * log (1/ Duty cycle)
2. The duty cycle of each frequency band mode reflects the determination requirements of the low channel measurement value.
3. Involving the test items of duty cycle compensation coefficient, the final results have been added and calculated by the software and presented.

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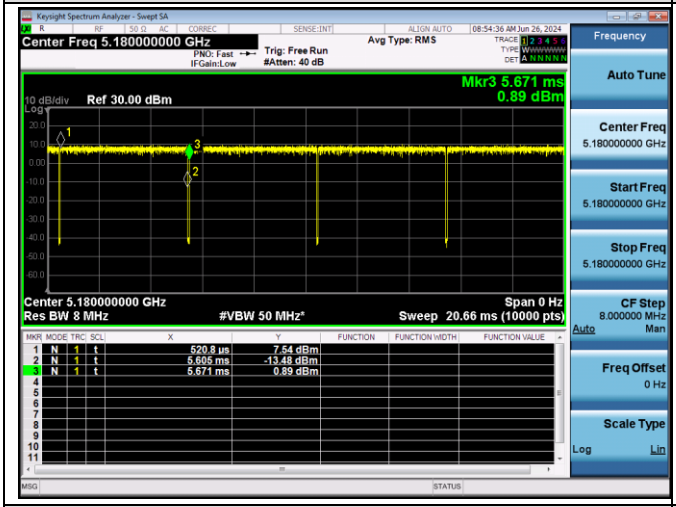
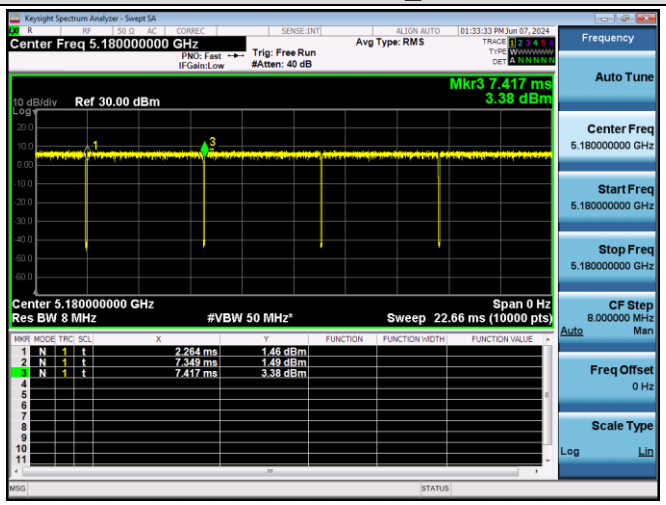
The test plots as follows:

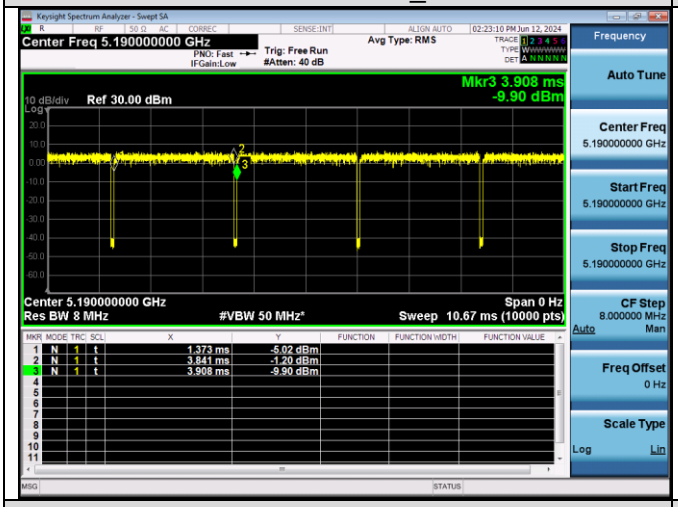
IEEE 802.11a_U-NII 1



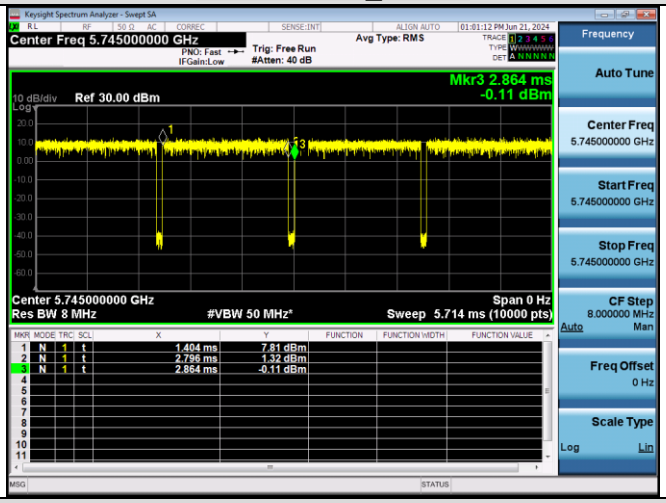
IEEE 802.11n-HT20_U-NII 1



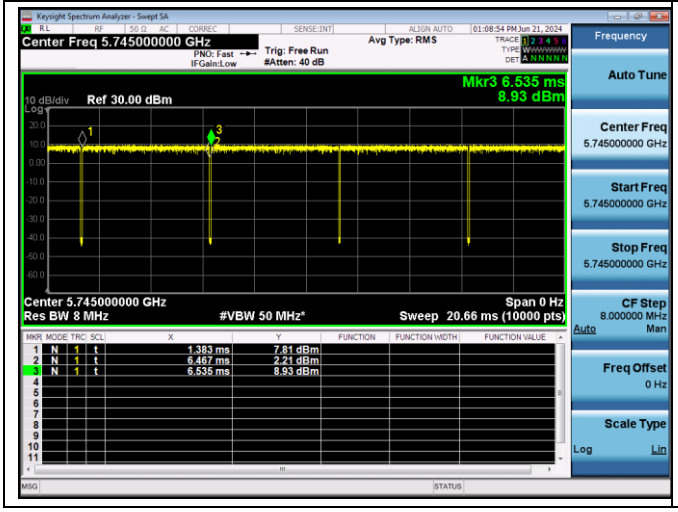
IEEE 802.11n-HT40_U-NII 1



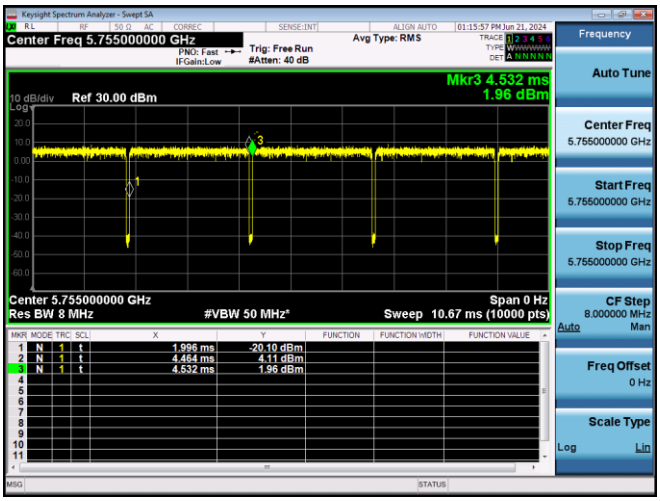
IEEE 802.11a_U-NII 3



IEEE 802.11n-HT20_U-NII 3



IEEE 802.11n-HT40_U-NII 3



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7. RF Output Power Measurement

7.1 Provisions Applicable

Operation Band	EUT Category		LIMIT
U-NII-1	☐	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p < 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
	☐	Fixed point-to-point Access Point	1 Watt (30 dBm)
	☐	Indoor Access Point	1 Watt (30 dBm)
	☒	Client devices	250mW (23.98 dBm)
U-NII-2A	/		250mW (23.98 dBm) or 11 dBm+10 log B*
U-NII-2C	/		250mW (23.98 dBm) or 11 dBm+10 log B*
U-NII-3	/		1 Watt (30 dBm)

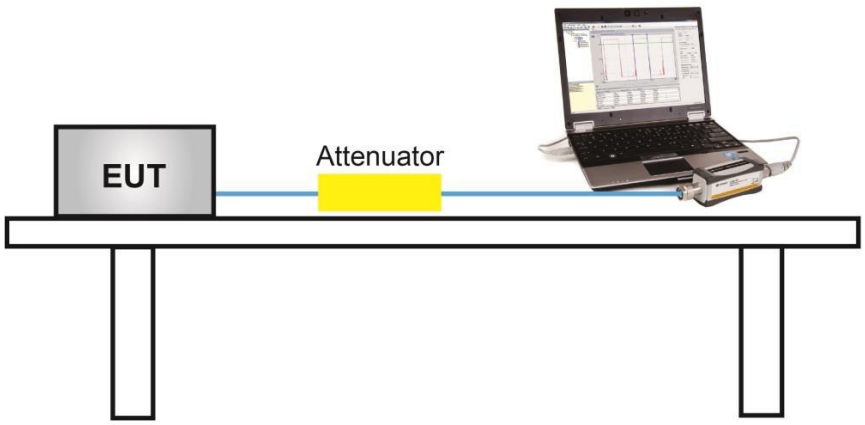
Note: Where B is the 26dB emission bandwidth in MHz.

7.2 Measurement Procedure

☒Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 12.3.3.1
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
3. The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
4. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
5. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
6. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
7. Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
8. Adjust the measurement in dBm by adding [10 log (1 / D)], where D is the duty cycle {e.g., [10 log (1 / 0.25)], if the duty cycle is 25%}.
9. Record the test results in the report.

7.3 Measurement Setup (Block Diagram of Configuration)



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7.4 Measurement Result

Test Data of Conducted Output Power and Equivalent Isotropic Radiated Power for band 5.15-5.25 GHz					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Limits (dBm)	EIRP (Average Power) (dBm)	Pass or Fail
802.11a	5180	10.83	23.98	15.08	Pass
	5200	7.46	23.98	11.71	Pass
	5240	7.70	23.98	11.95	Pass
802.11n20	5180	9.26	23.98	13.51	Pass
	5200	9.35	23.98	13.60	Pass
	5240	9.26	23.98	13.51	Pass
802.11n40	5190	9.61	23.98	13.86	Pass
	5230	9.45	23.98	13.70	Pass

Test Data of Conducted Output Power and Equivalent Isotropic Radiated Power for band 5.725-5.850 GHz					
Test Mode	Test Channel (MHz)	Average Power (dBm)	Limits (dBm)	EIRP (Average Power) (dBm)	Pass or Fail
802.11a	5745	11.83	30	16.08	Pass
	5785	11.82	30	16.07	Pass
	5825	12.17	30	16.42	Pass
802.11n20	5745	11.54	30	15.79	Pass
	5785	11.62	30	15.87	Pass
	5825	11.97	30	16.22	Pass
802.11n40	5755	11.97	30	16.22	Pass
	5795	11.91	30	16.16	Pass

Note: ELRP (dBm)= Average Conducted Output Power (dBm) + Antenna Gain (dBi)

Antenna Gain: 4.25dBi

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8. 6dB&26dB and 99% Occupied Bandwidth Measurement

8.1 Provisions Applicable

The minimum 6dB bandwidth shall be at least 500 kHz.

8.2 Measurement Procedure

◆ **-6dB bandwidth (DTS bandwidth) Test setting:**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on operation frequency individually.
3. Set RBW = 100kHz.
4. Set the VBW ⩾3*RBW. Detector = Peak. Trace mode = max hold.
5. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.

◆ **99% occupied bandwidth test setting:**

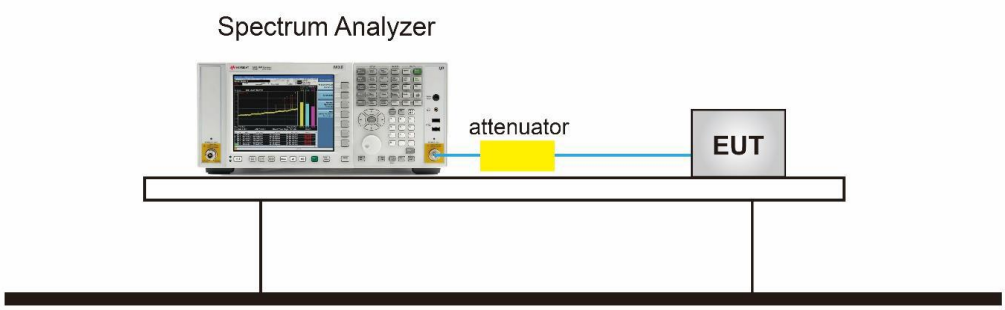
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 1.5 to 5 times the OBW, centered on a nominal channel
   The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

◆ **-26dB Bandwidth test setting:**

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Note: The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

8.3 Measurement Setup (Block Diagram of Configuration)



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8.4 Measurement Results

Test Data of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-26dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11a	5180	17.795	20.606	N/A	Pass
	5200	17.836	20.491	N/A	Pass
	5240	17.804	20.656	N/A	Pass
802.11n20	5180	17.781	20.600	N/A	Pass
	5200	17.807	20.576	N/A	Pass
	5240	17.810	20.701	N/A	Pass
802.11n40	5190	36.281	40.406	N/A	Pass
	5230	36.274	45.001	N/A	Pass

Test Data of Occupied Bandwidth and DTS Bandwidth for band 5.725-5.85 GHz					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11a	5745	18.894	16.351	0.5	Pass
	5785	17.897	16.367	0.5	Pass
	5825	18.264	16.348	0.5	Pass
802.11n20	5745	18.745	17.743	0.5	Pass
	5785	19.083	17.580	0.5	Pass
	5825	19.325	17.614	0.5	Pass
802.11n40	5755	38.202	36.067	0.5	Pass
	5795	38.213	36.335	0.5	Pass

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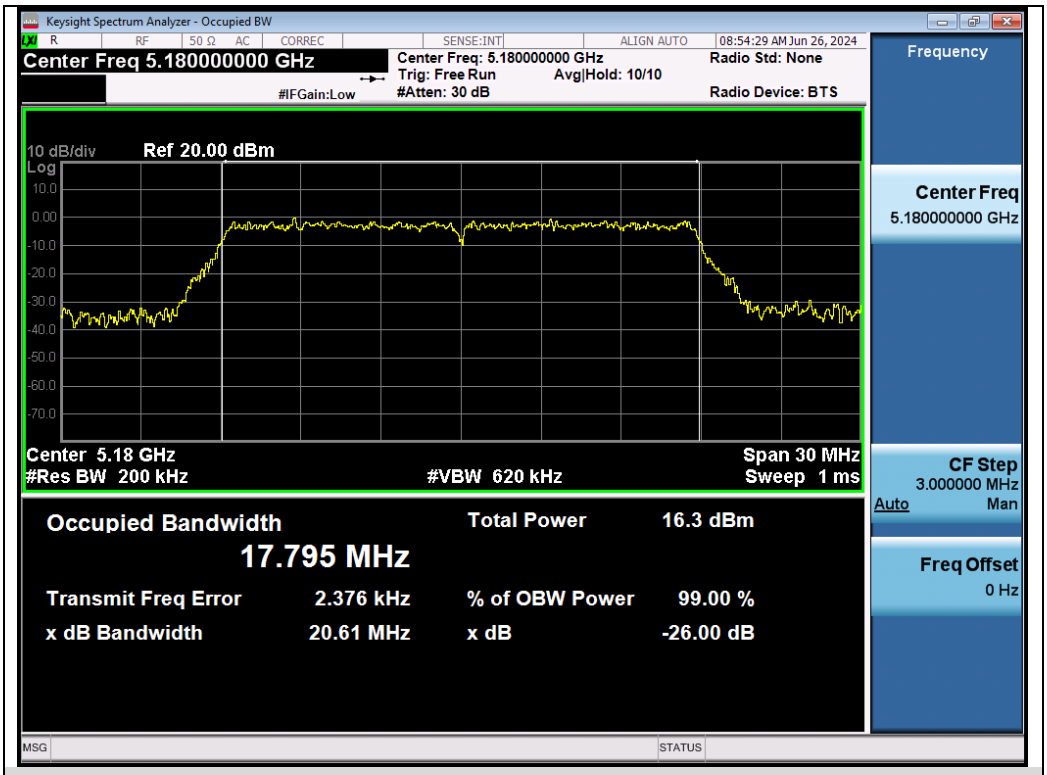
Test Graphs of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_OBW

Test_Graph_802.11a_ANT1_5200_6Mbps_OBW

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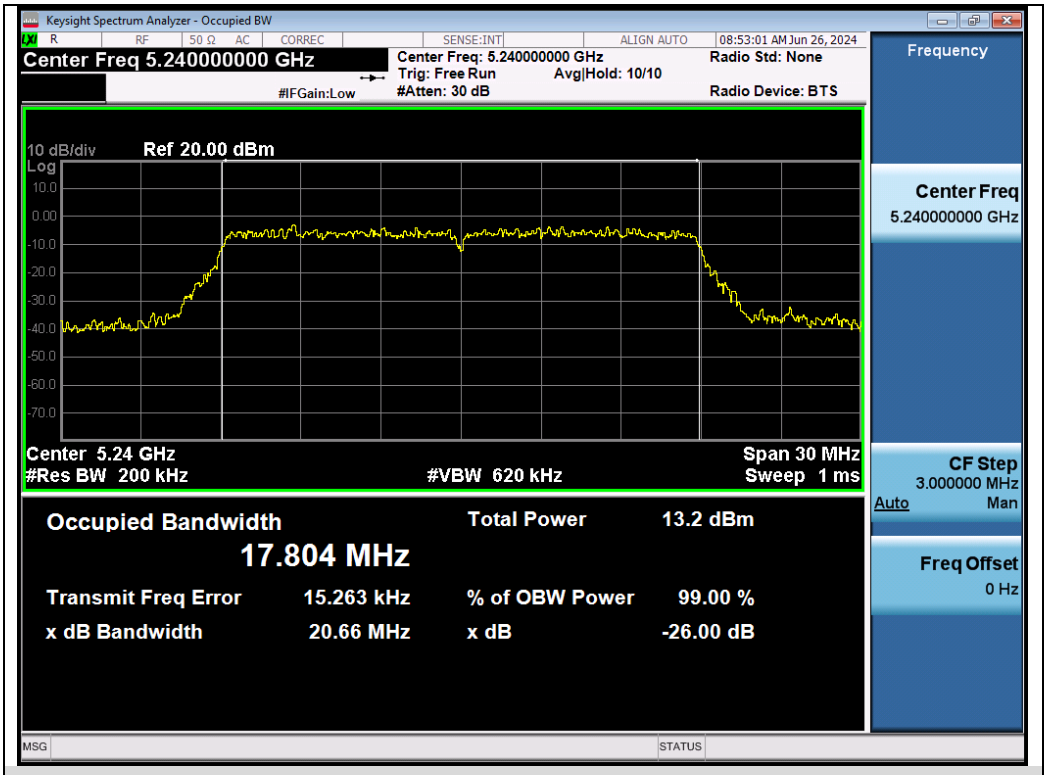
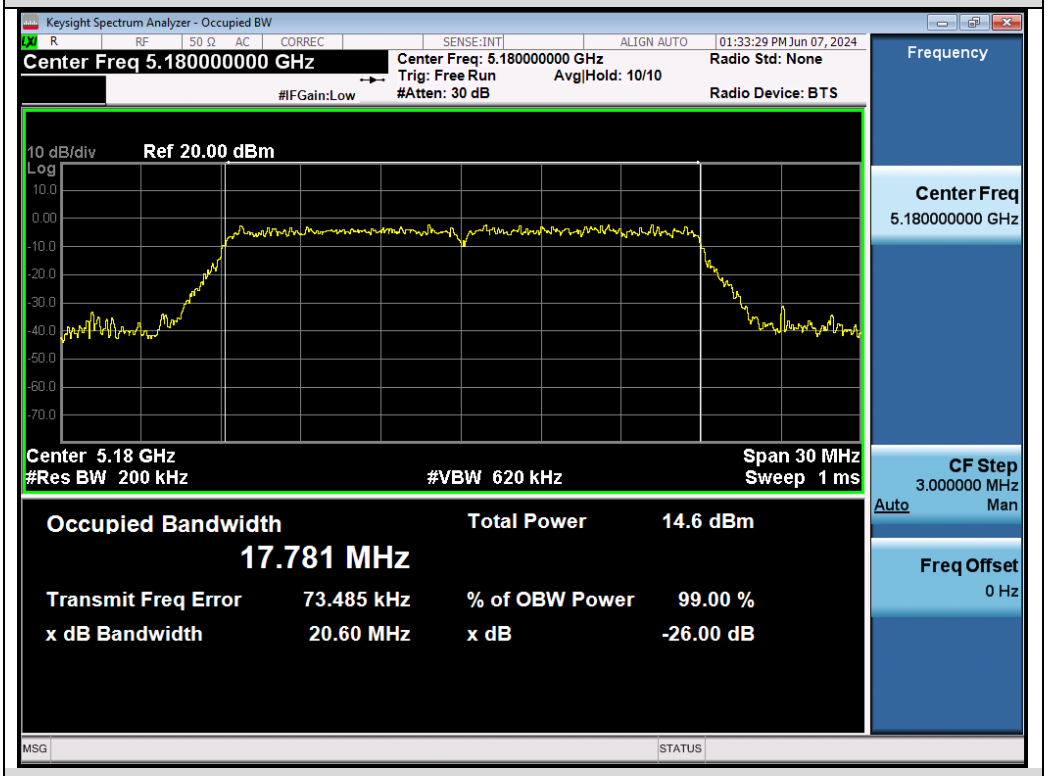


Test_Graph_802.11a_ANT1_5240_6Mbps_OBW



Test_Graph_802.11n20_ANT1_5180_MCS0_OBW

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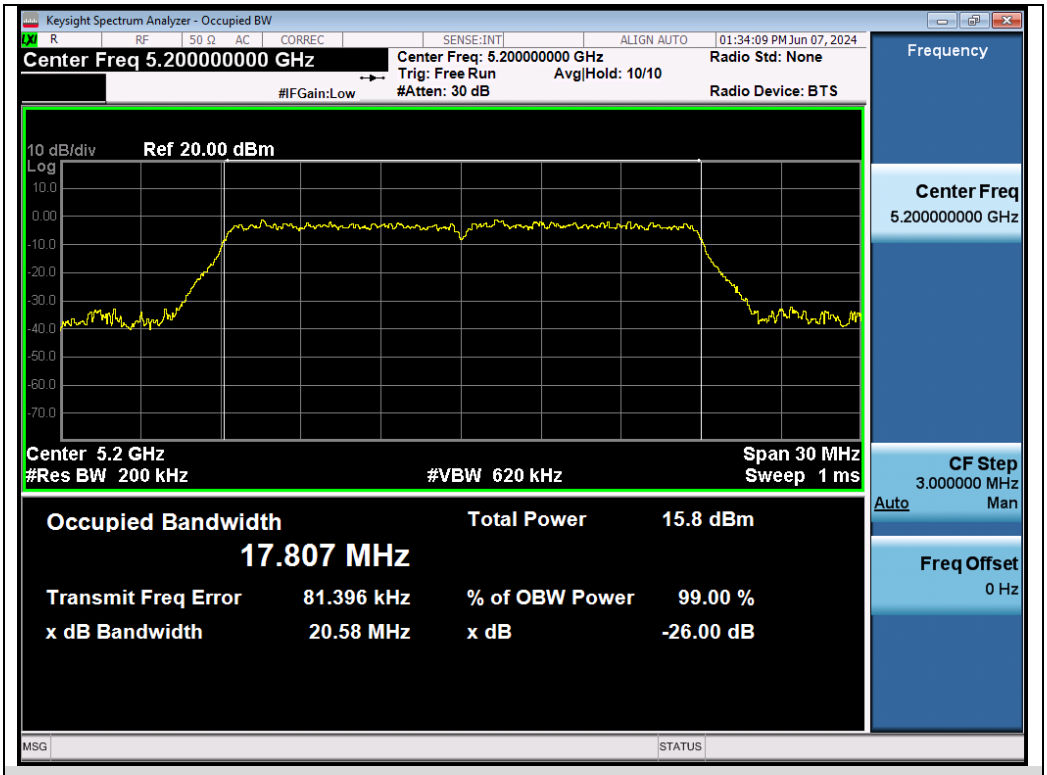

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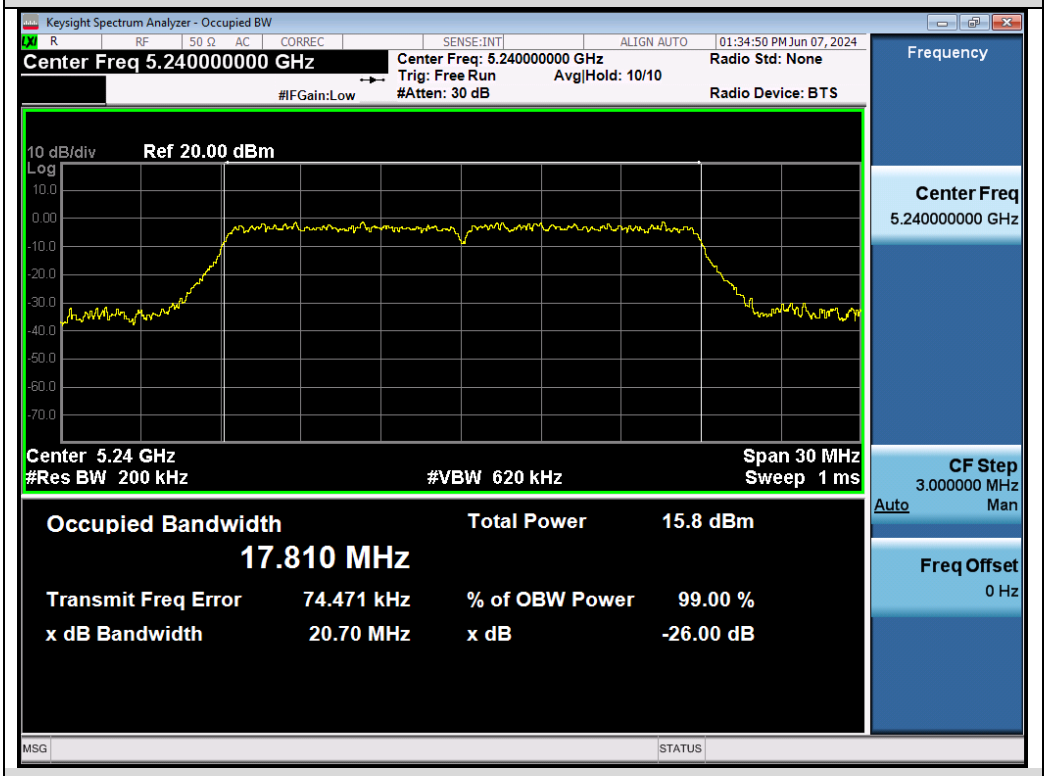

Test_Graph_802.11n20_ANT1_5240_MCS0_OBW

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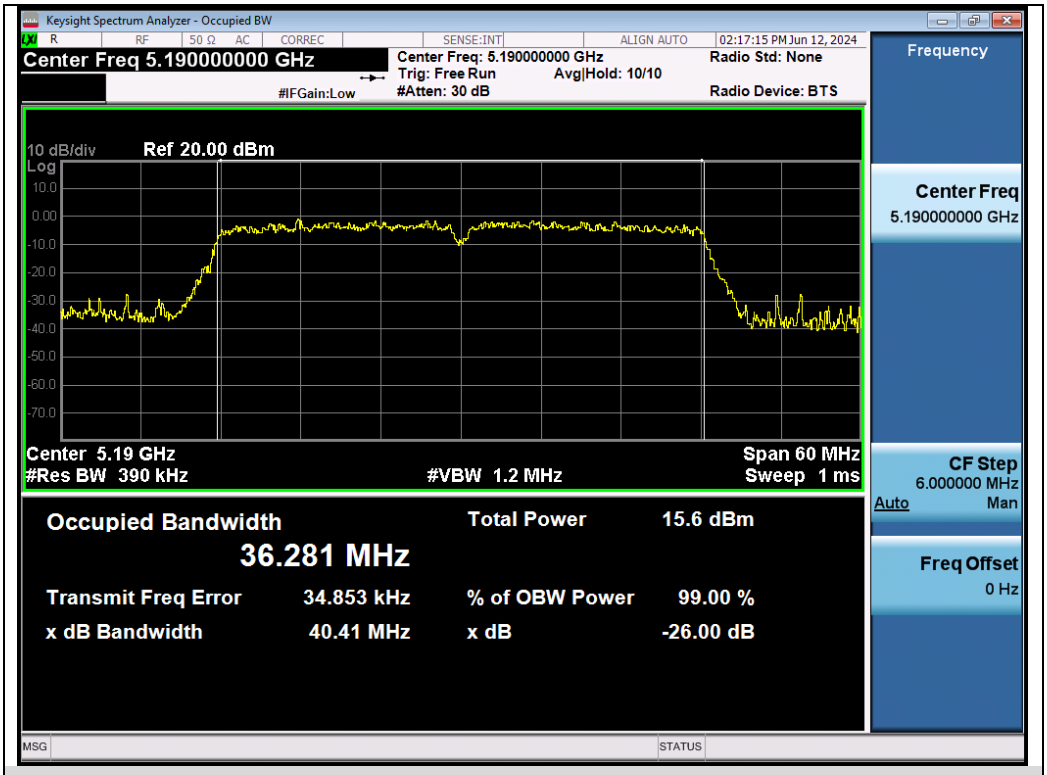

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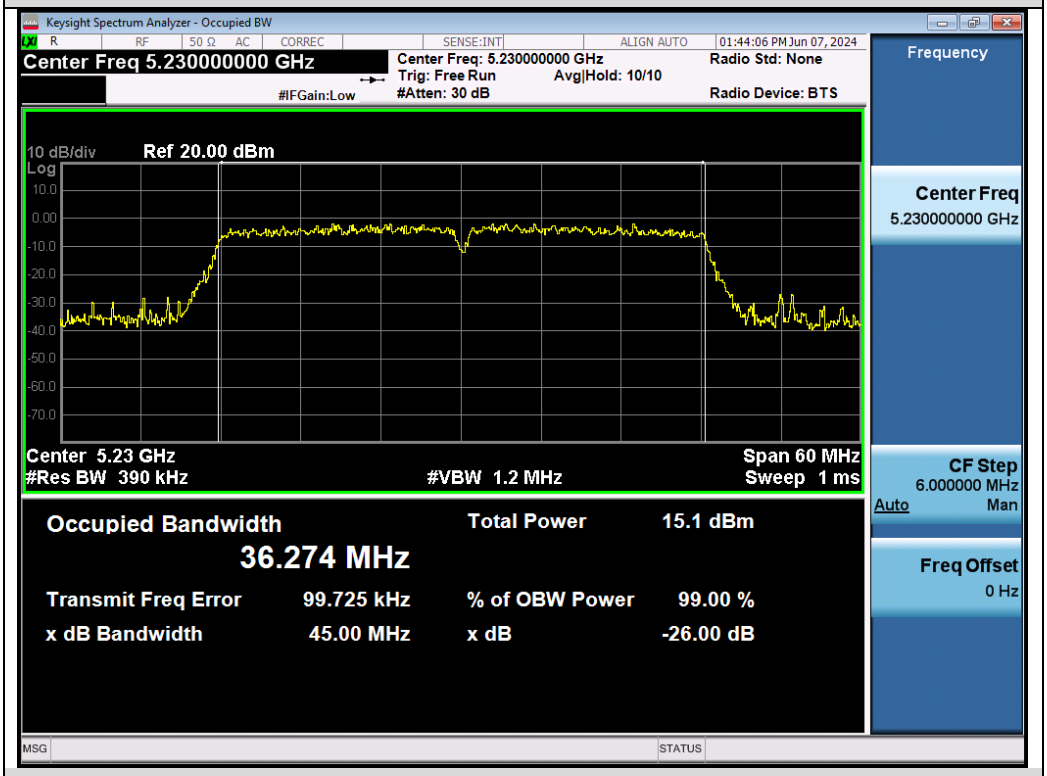

Test_Graph_802.11n40_ANT1_5230_MCS0_OBW

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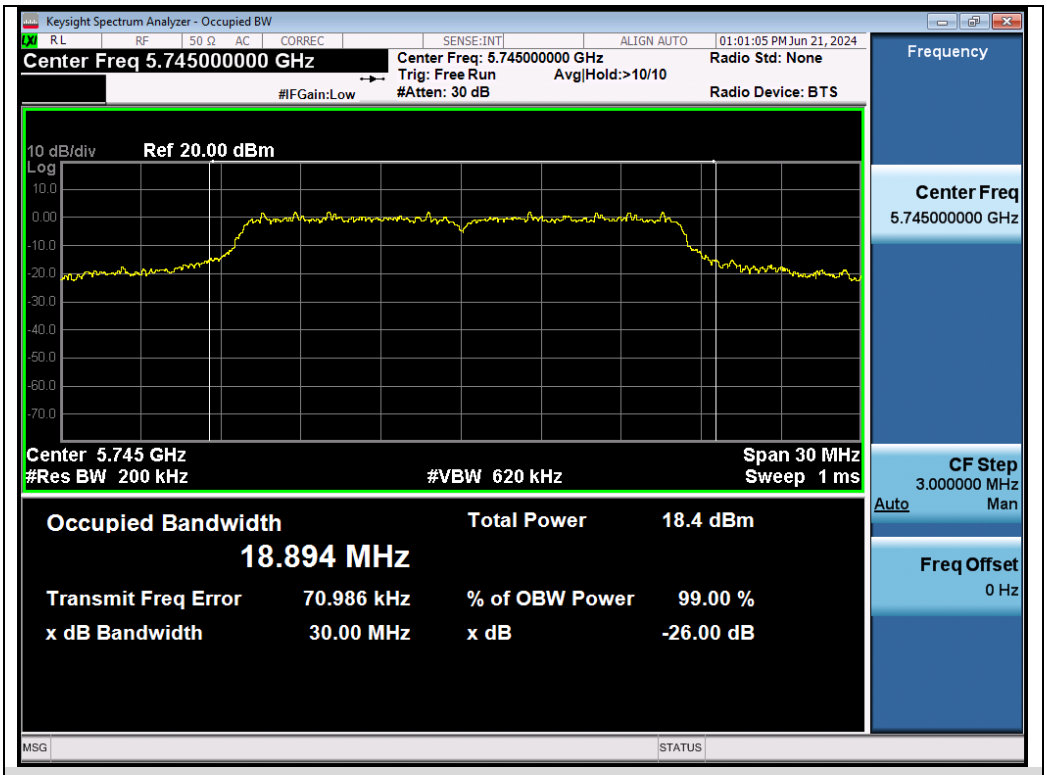
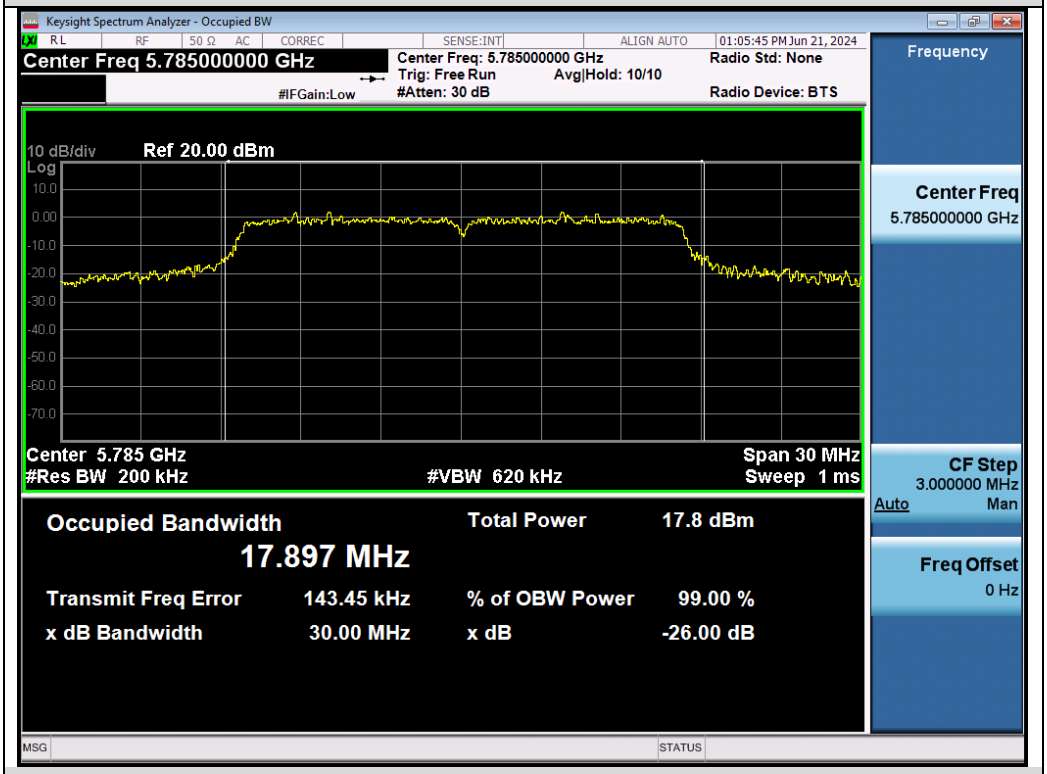
Test Graphs of Occupied Bandwidth and -26dB Bandwidth for band 5.745-5.825 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_OBW



Test_Graph_802.11a_ANT1_5785_6Mbps_OBW

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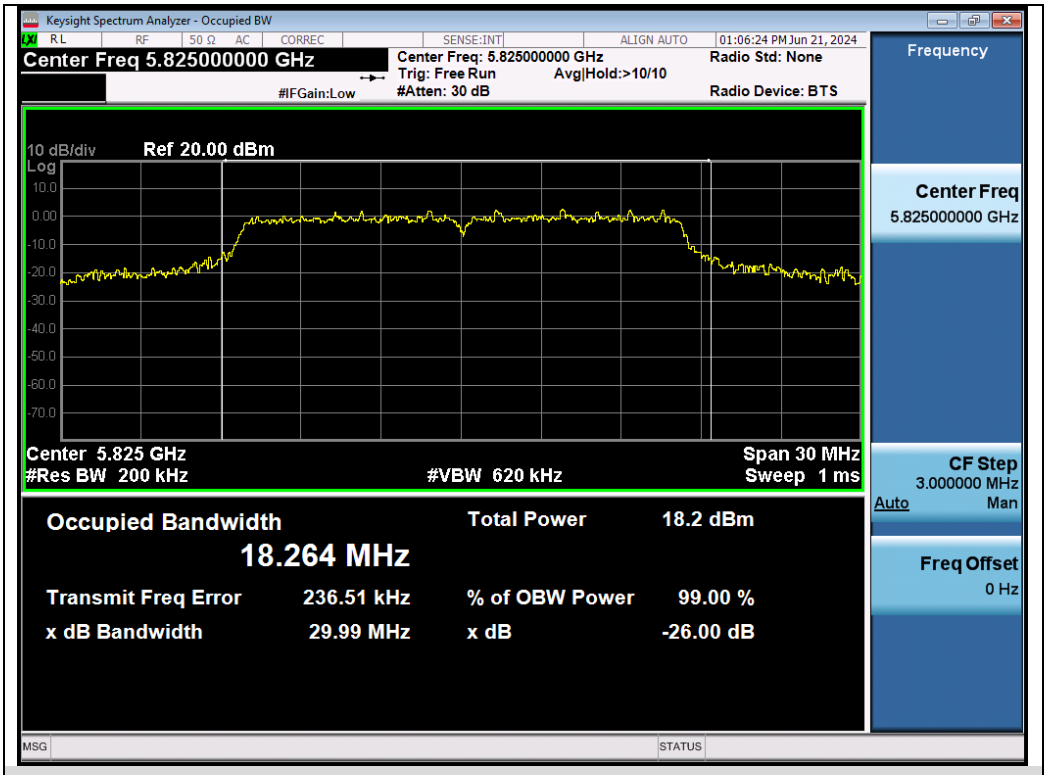
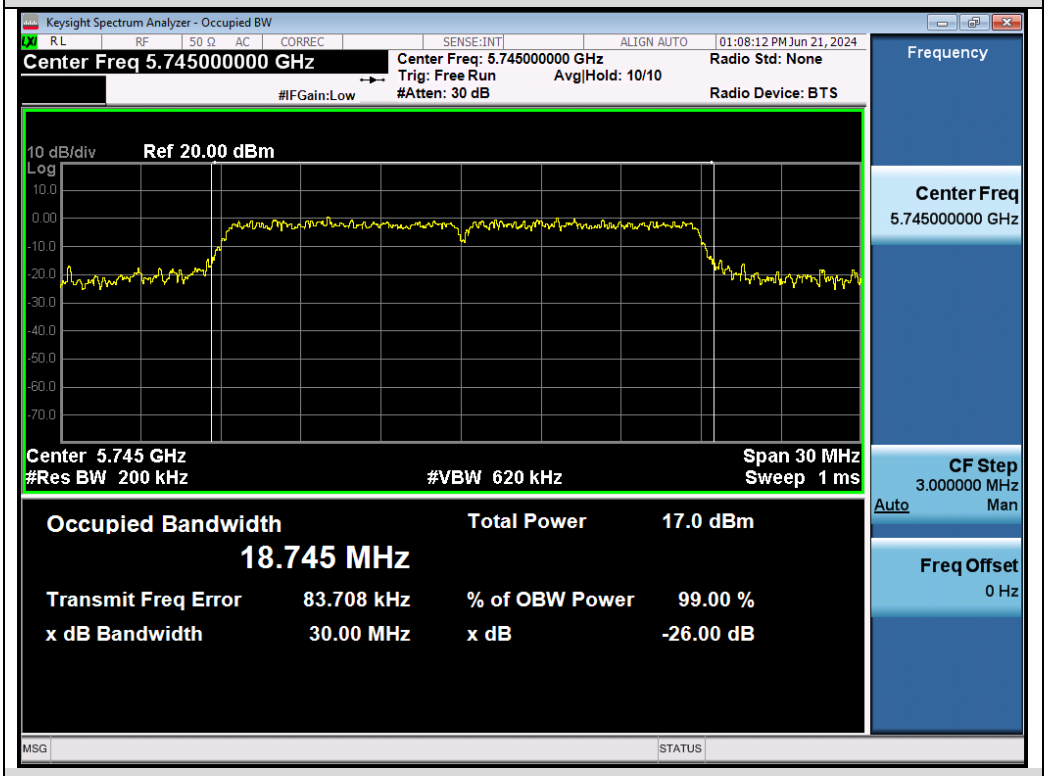


Test_Graph_802.11a_ANT1_5825_6Mbps_OBW



Test_Graph_802.11n20_ANT1_5745_MCS0_OBW

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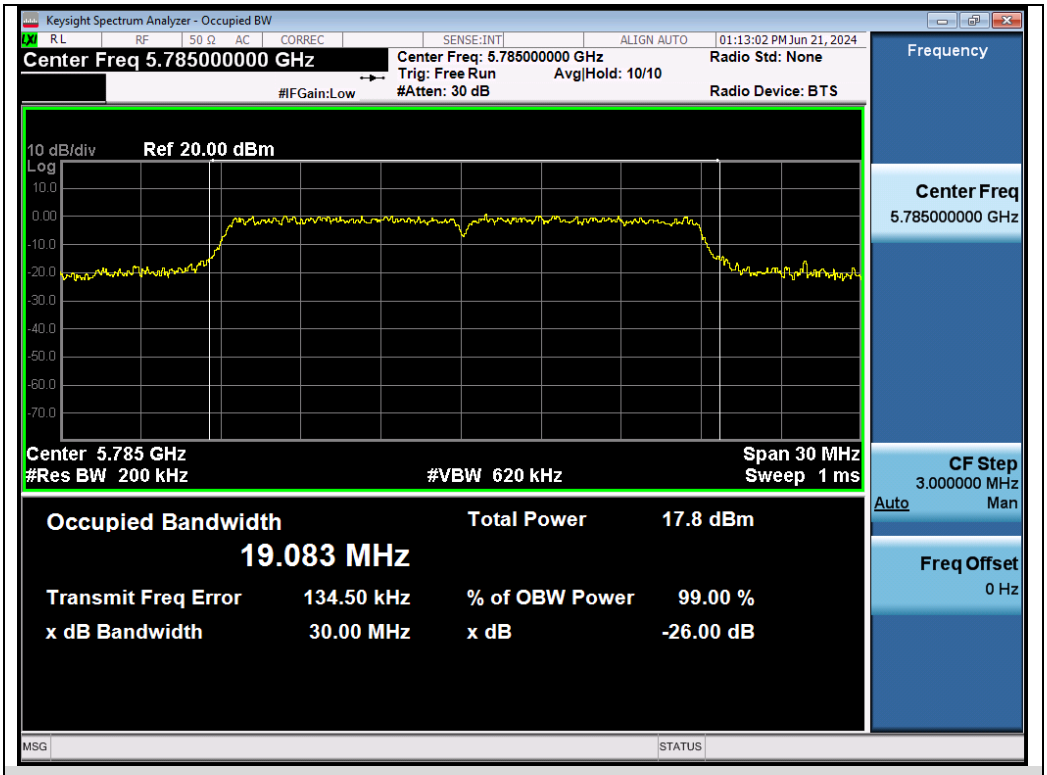

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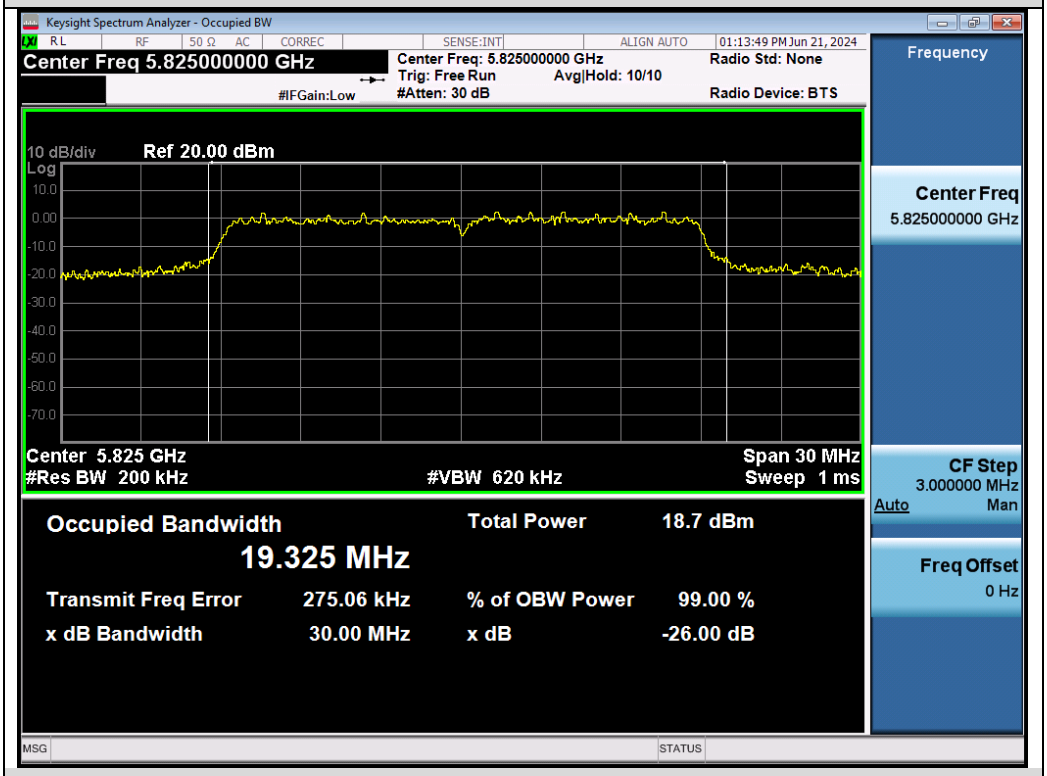

Test_Graph_802.11n20_ANT1_5825_MCS0_OBW

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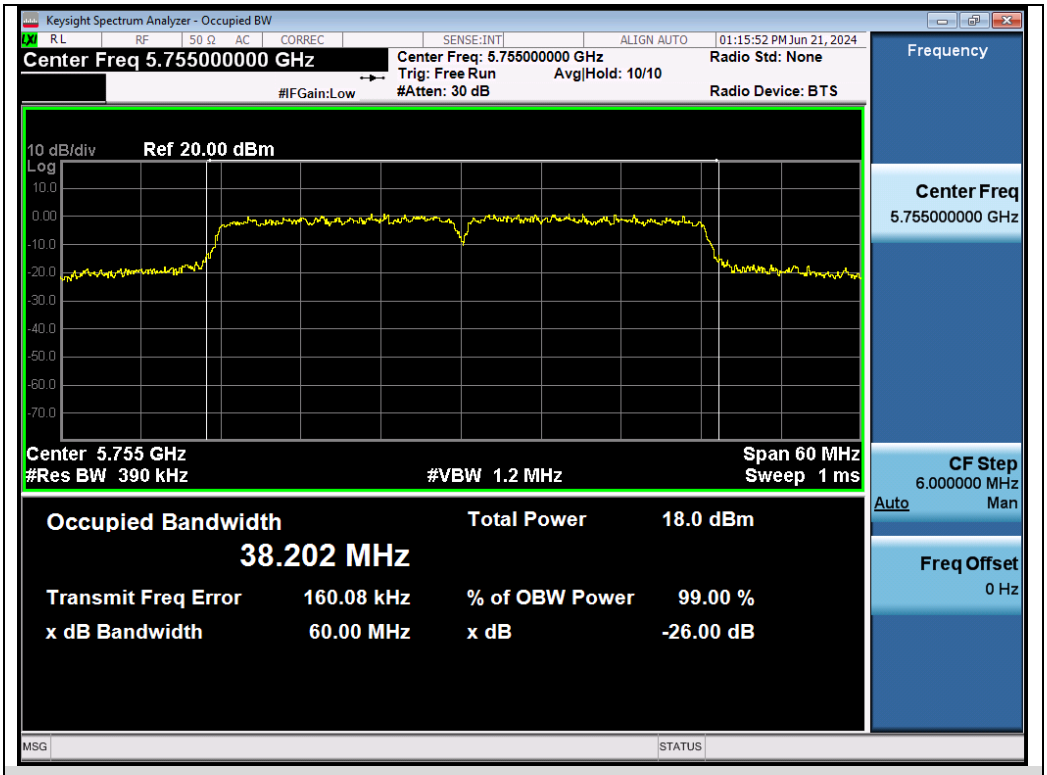
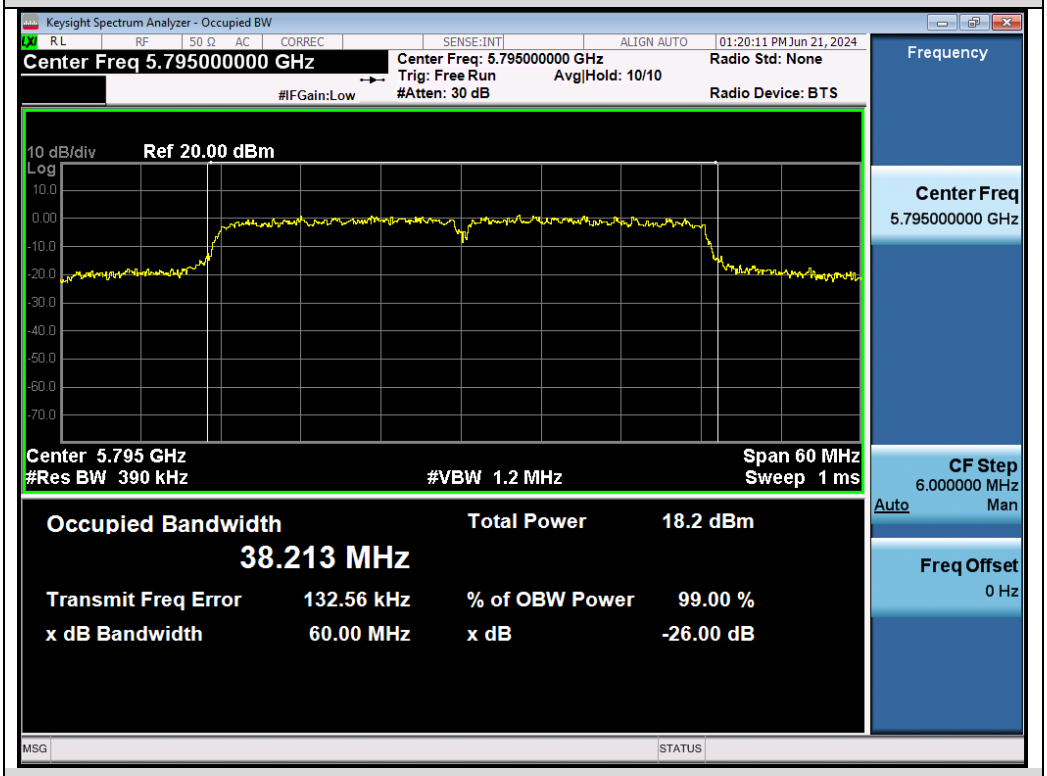


Test_Graph_802.11n40_ANT1_5755_MCS0_OBW



Test_Graph_802.11n40_ANT1_5795_MCS0_OBW

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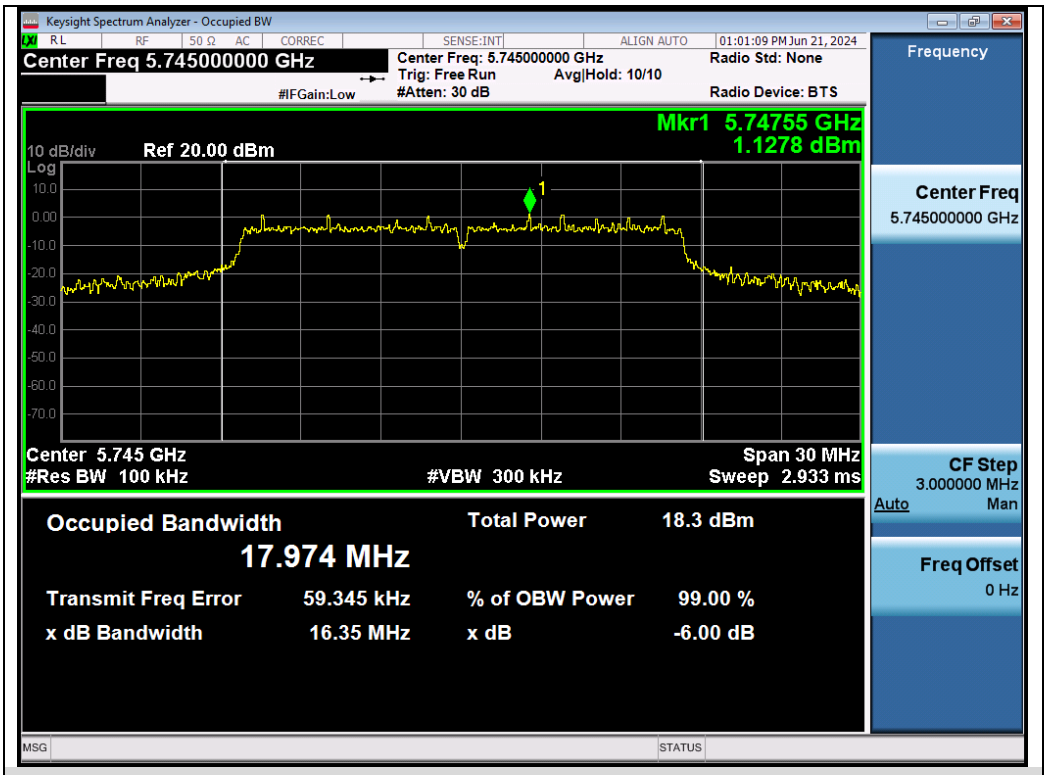
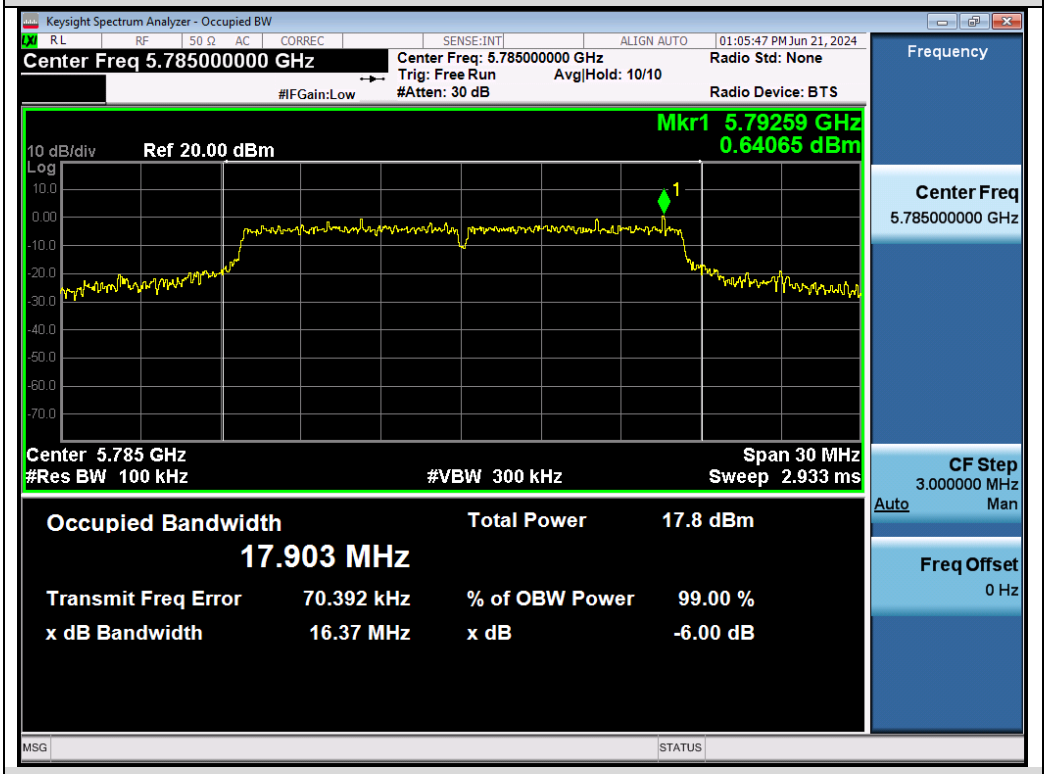
Test Graphs of DTS Bandwidth for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_DTSBW



Test_Graph_802.11a_ANT1_5785_6Mbps_DTSBW

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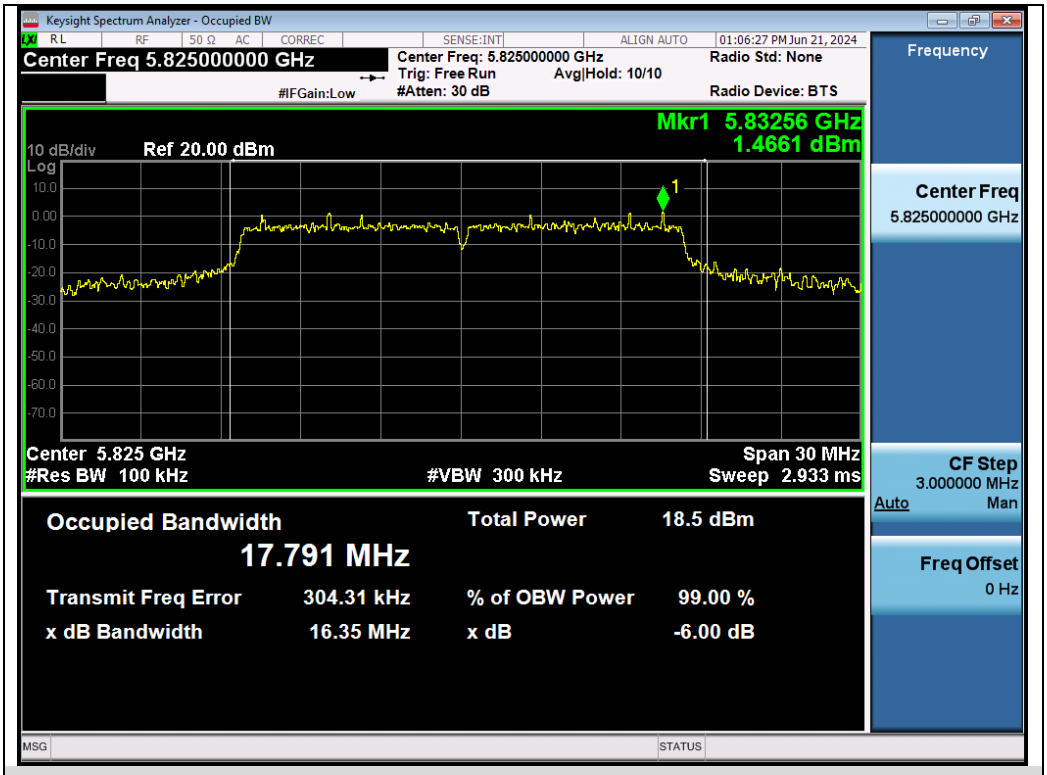
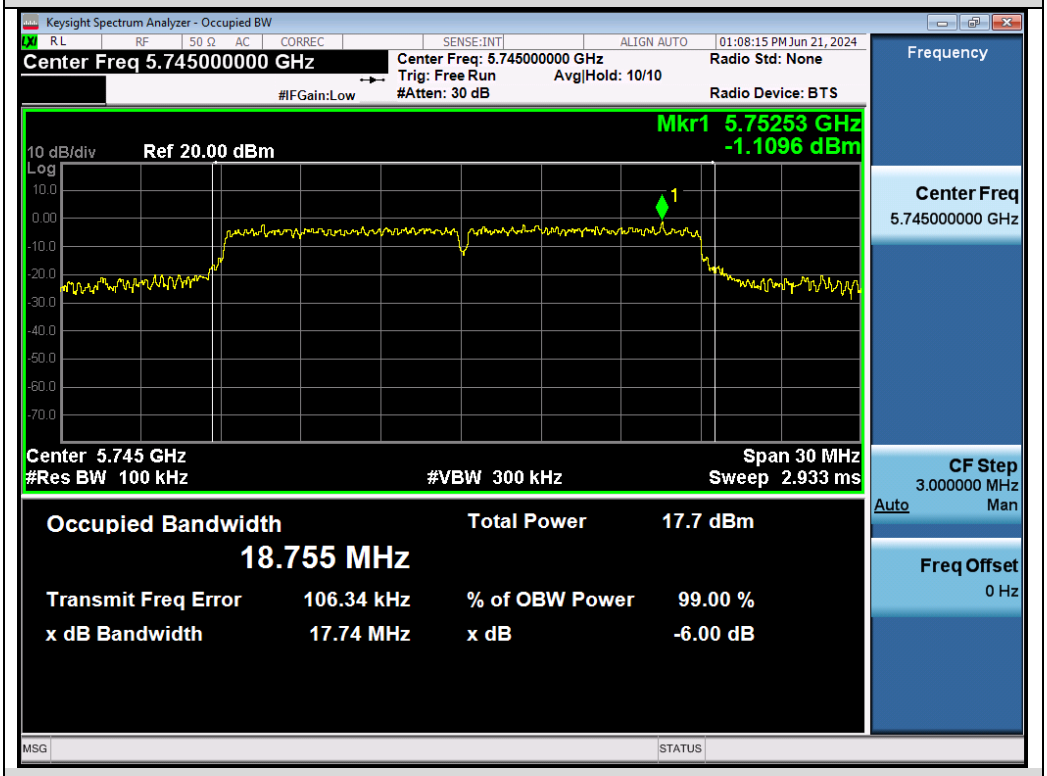


Test_Graph_802.11a_ANT1_5825_6Mbps_DTSBW



Test_Graph_802.11n20_ANT1_5745_MCS0_DTSBW

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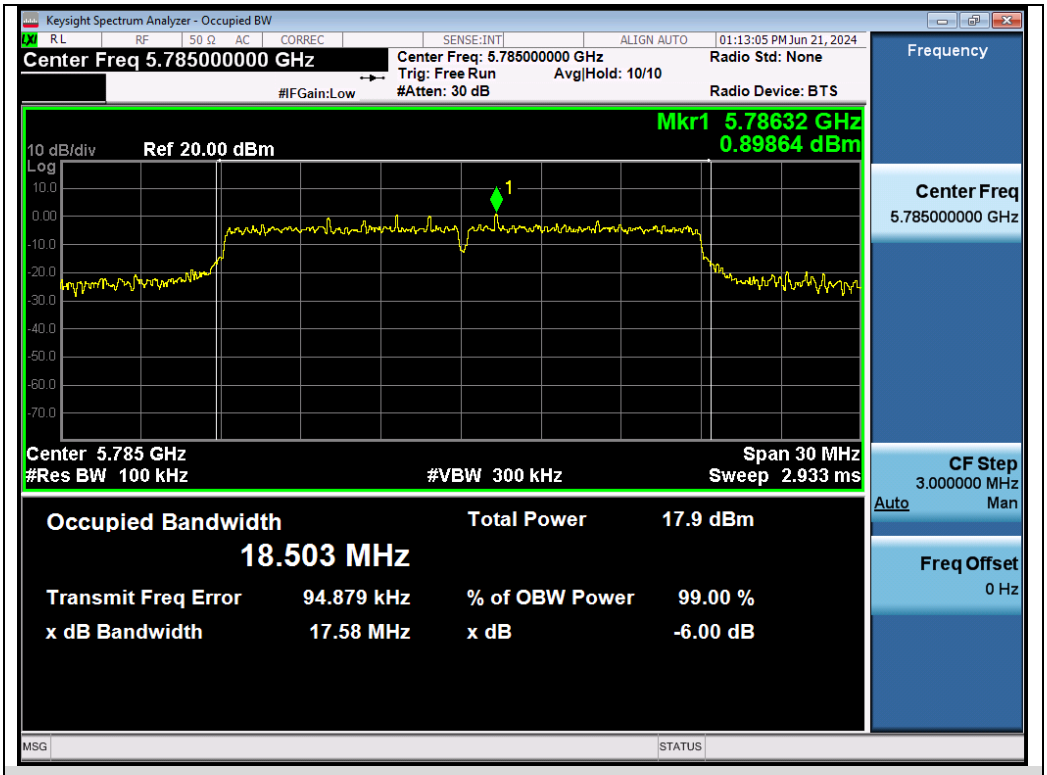
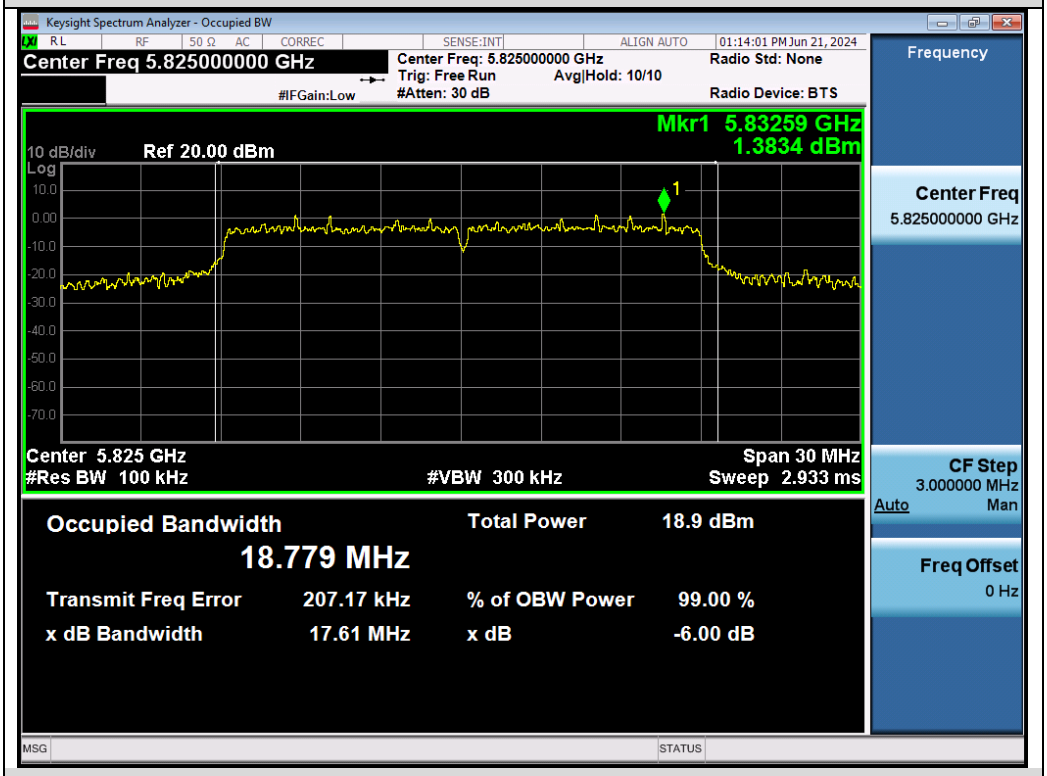


Test_Graph_802.11n20_ANT1_5785_MCS0_DTSBW



Test_Graph_802.11n20_ANT1_5825_MCS0_DTSBW

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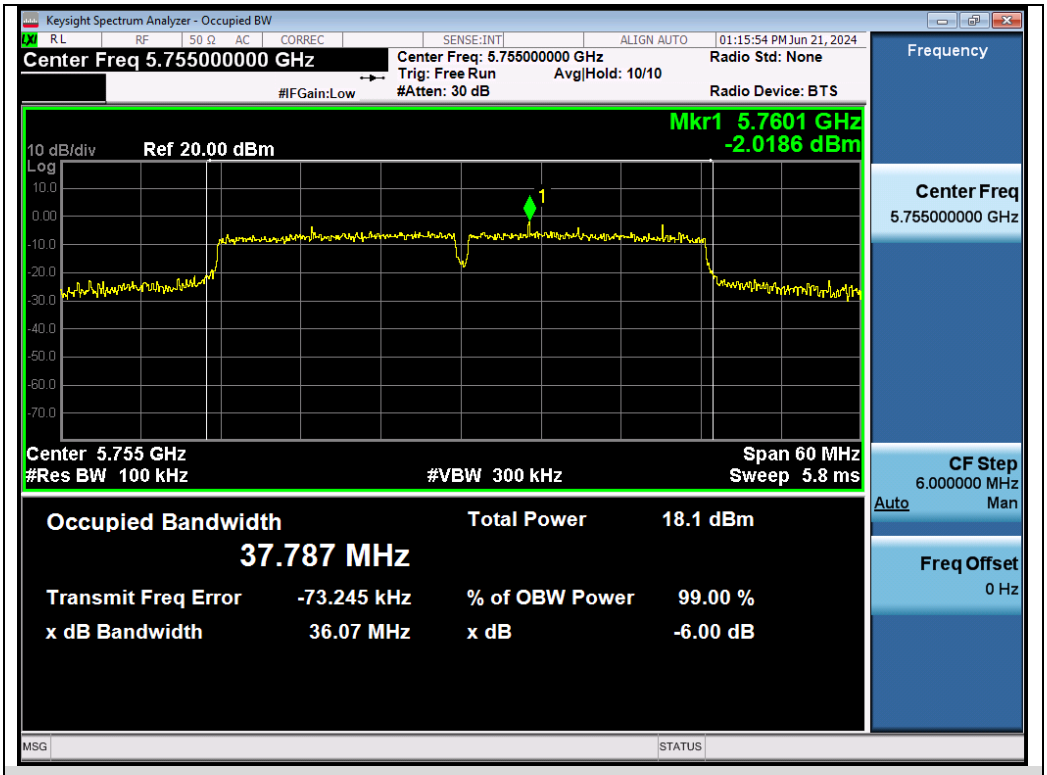
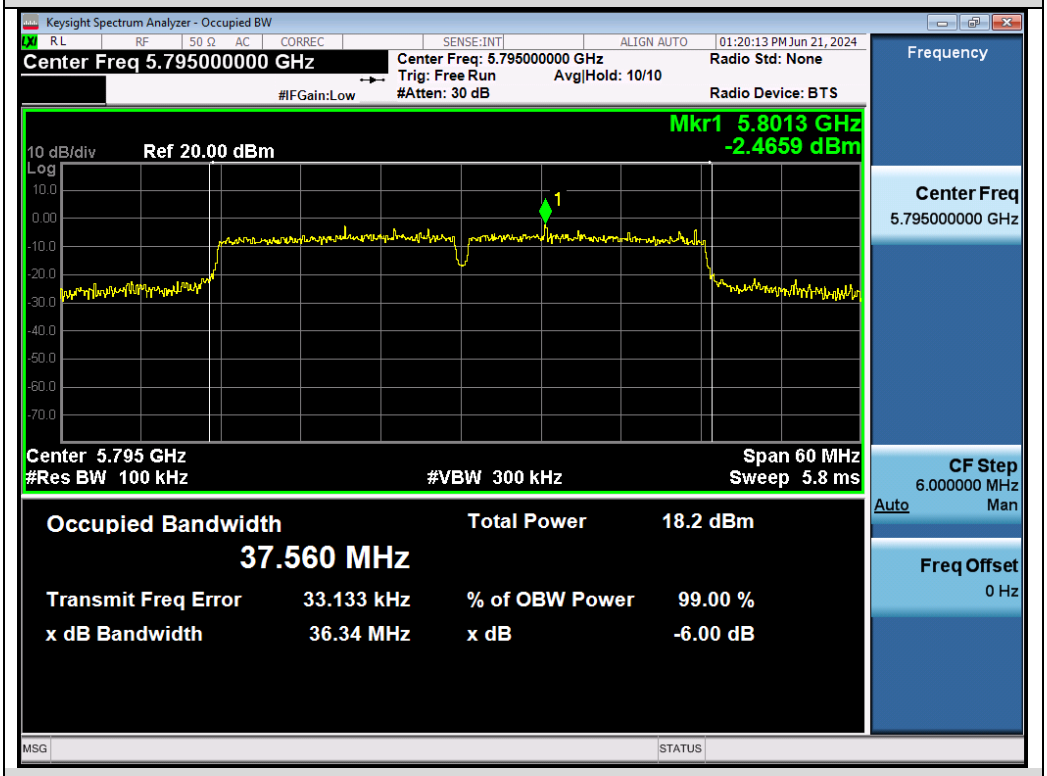


Test_Graph_802.11n40_ANT1_5755_MCS0_DTSBW



Test_Graph_802.11n40_ANT1_5795_MCS0_DTSBW

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9. Power Spectral Density Measurement

9.1 Provisions Applicable

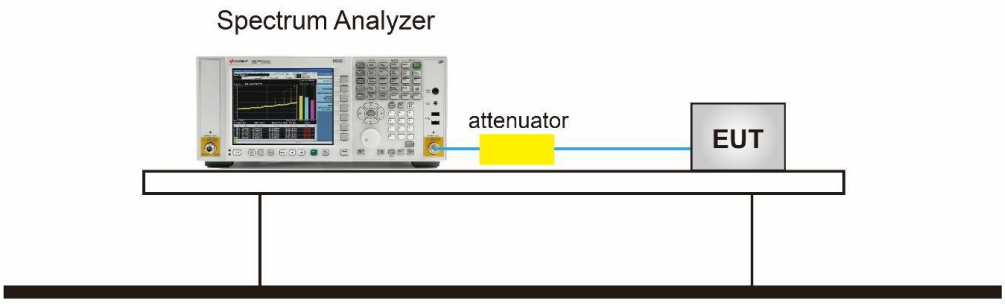
Operation Band	EUT Category		LIMIT
U-NII-1	☐	Outdoor Access Point	17dBm/ MHz
	☐	Fixed point-to-point Access Point	17dBm/ MHz
	☐	Indoor Access Point	17dBm/ MHz
	☒	Client devices	11dBm/ MHz
U-NII-2A	/		11dBm/ MHz
U-NII-2C	/		11dBm/ MHz
U-NII-3	/		30 dBm/500kHz

9.2 Measurement Procedure

☒For Average power spectral density test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz.
4. If measurement bandwidth of Maximum PSD is specified in 500 kHz, RBW = 100KHz
5. Set VBW≥[3×RBW].
6. Sweep Time=Auto couple.
7. Detector function=RMS (i.e., power averaging).
8. Trace average at least 100 traces in power averaging (rms) mode.
9. When the measurement bandwidth of Maximum PSD is specified in 100 kHz, add a constant factor 10*log(500kHz/100kHz) = 6.99 dB to the measured result.
10. Determine according to the duty cycle of the equipment: when it is less than 98%, follow the steps below.
11. Add [10 log (1/D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is 25%.
12. Record the test results in the report.

9.3 Measurement Setup (Block Diagram of Configuration)



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9.4 Measurement Result

Test Data of Conducted Output Power Density for band 5.15-5.25 GHz				
Test Mode	Test Channel (MHz)	Average Power Density (dBm/MHz)	Limits (dBm/MHz)	Pass or Fail
802.11a	5180	-0.324	11	Pass
	5200	-4.010	11	Pass
	5240	-3.929	11	Pass
802.11n20	5180	-2.227	11	Pass
	5200	-2.147	11	Pass
	5240	-2.345	11	Pass
802.11n40	5190	-4.641	11	Pass
	5230	-4.970	11	Pass

Test Data of Conducted Output Power Density for band 5.725-5.85 GHz					
Test Mode	Test Channel (MHz)	Average Power Density (dBm/100kHz)	Average Power Density (dBm/500kHz)	Limits (dBm/500kHz)	Pass or Fail
802.11a	5745	-8.510	-1.520	30	Pass
	5785	-8.578	-1.588	30	Pass
	5825	-8.033	-1.043	30	Pass
802.11n20	5745	-8.639	-1.446	30	Pass
	5785	-8.645	-1.655	30	Pass
	5825	-8.779	-1.789	30	Pass
802.11n40	5755	-11.539	-4.549	30	Pass
	5795	-11.604	-4.614	30	Pass

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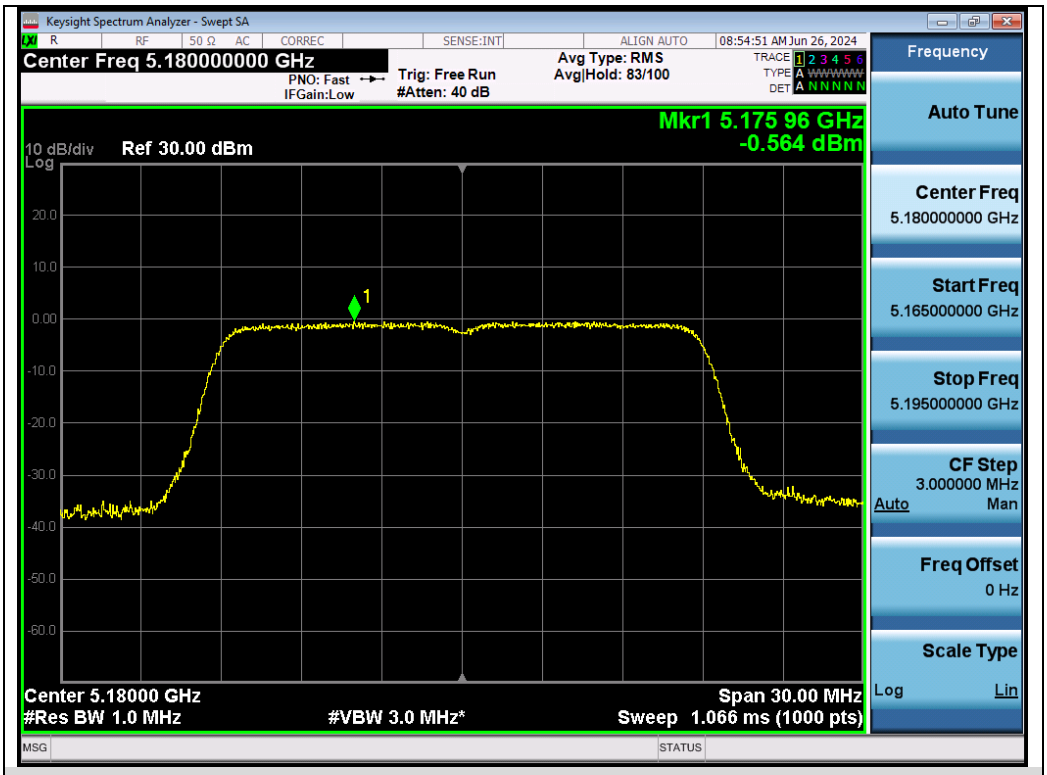
Test Graphs of Conducted Output Power Spectral Density for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_PSD

Test_Graph_802.11a_ANT1_5200_6Mbps_PSD

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Test_Graph_802.11a_ANT1_5240_6Mbps_PSD

Test_Graph_802.11n20_ANT1_5180_MCS0_PSD

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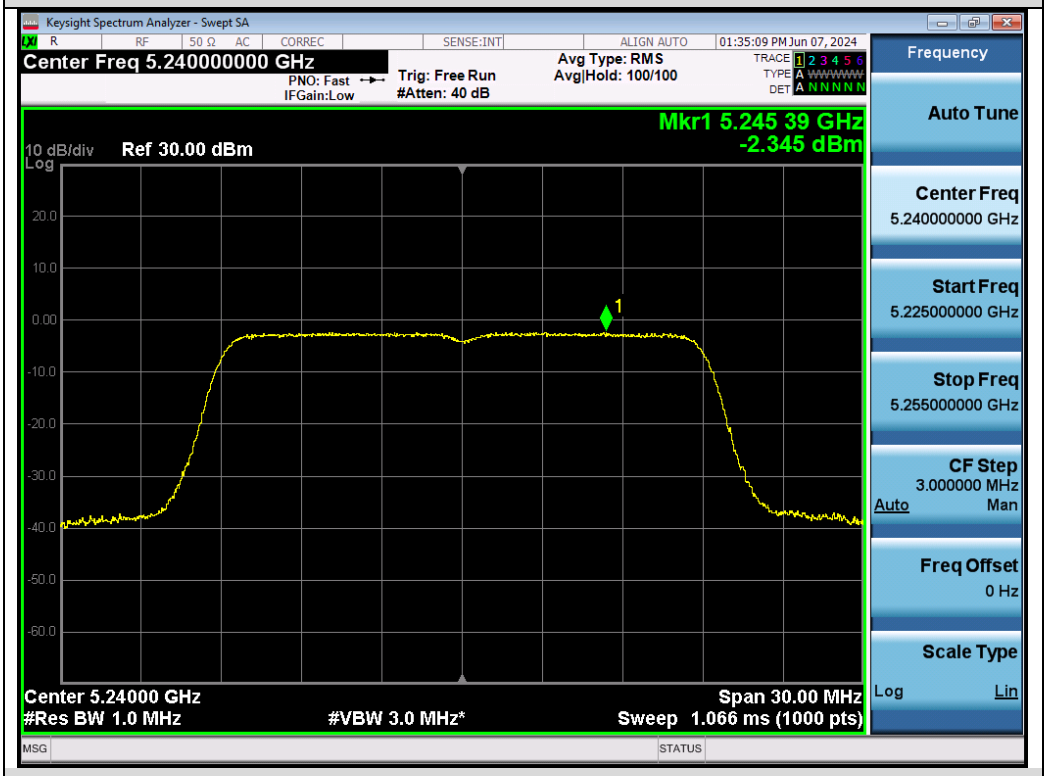
Test_Graph_802.11n20_ANT1_5200_MCS0_PSD



Test_Graph_802.11n20_ANT1_5240_MCS0_PSD

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Test_Graph_802.11n40_ANT1_5190_MCS0_PSD

Test_Graph_802.11n40_ANT1_5230_MCS0_PSD

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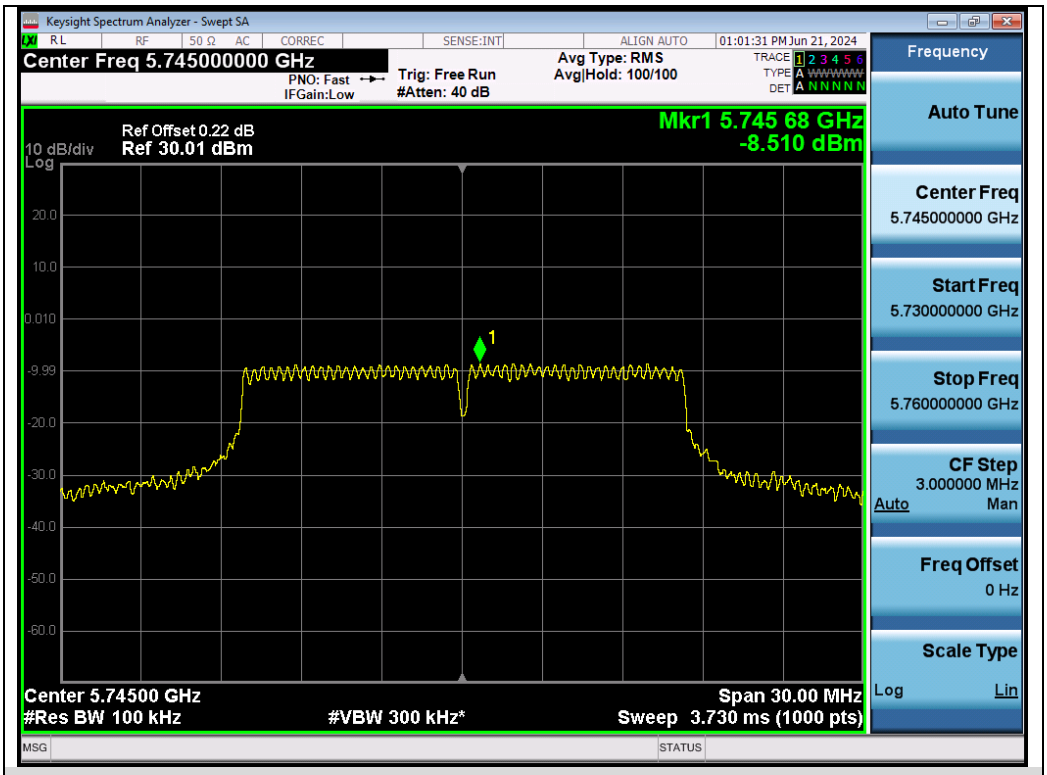
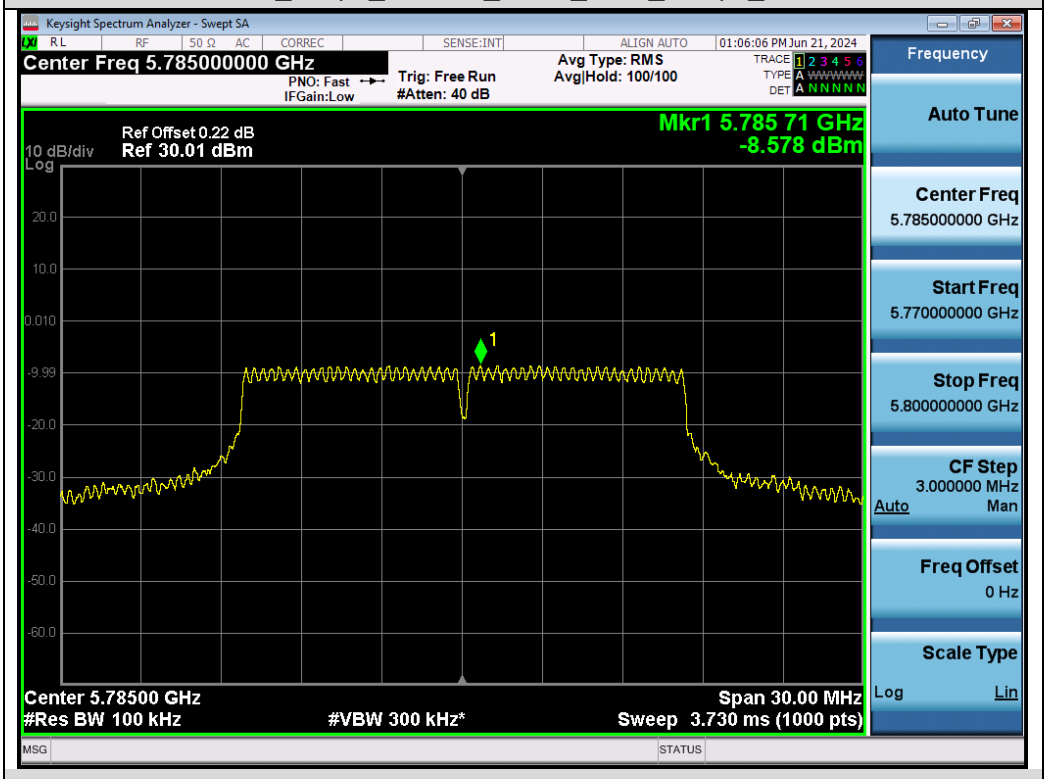
Test Graphs of Conducted Output Power Spectral Density for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_PSD



Test_Graph_802.11a_ANT1_5785_6Mbps_PSD

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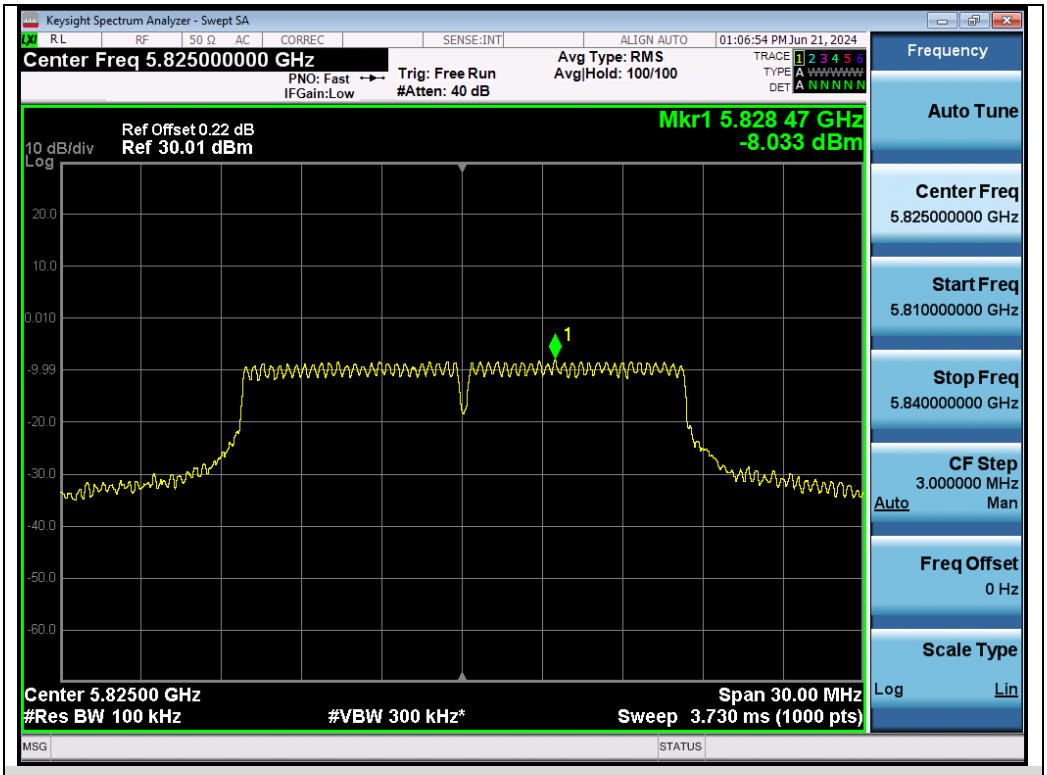
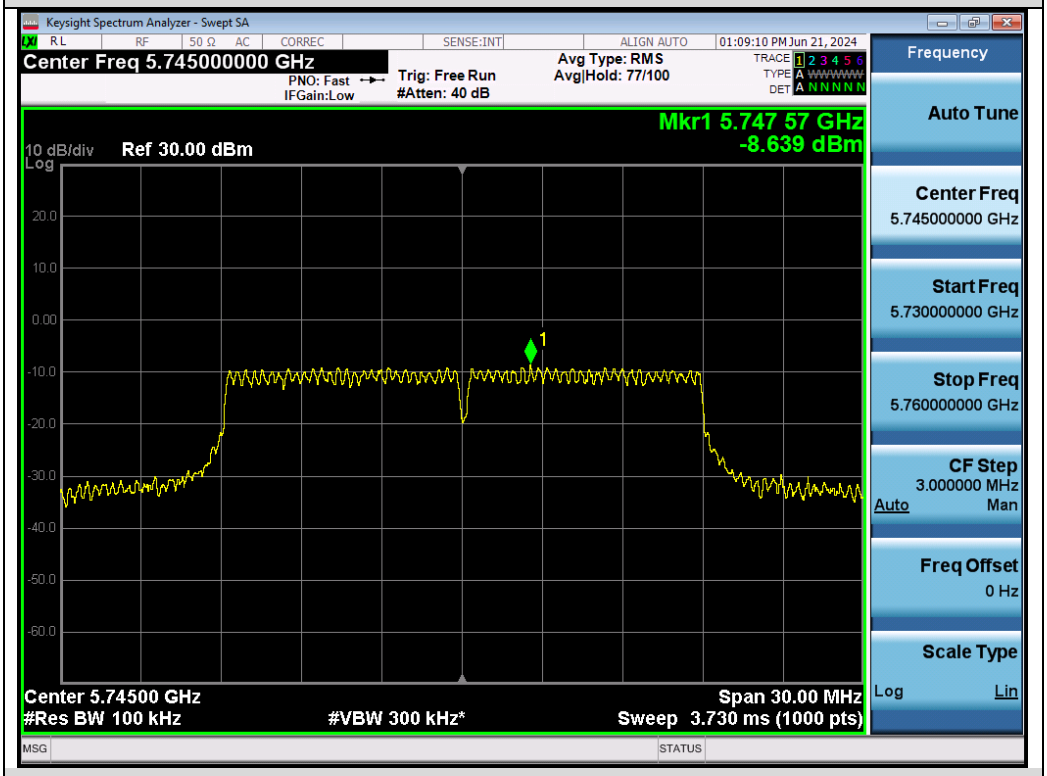


Test_Graph_802.11a_ANT1_5825_6Mbps_PSD



Test_Graph_802.11n20_ANT1_5745_MCS0_PSD

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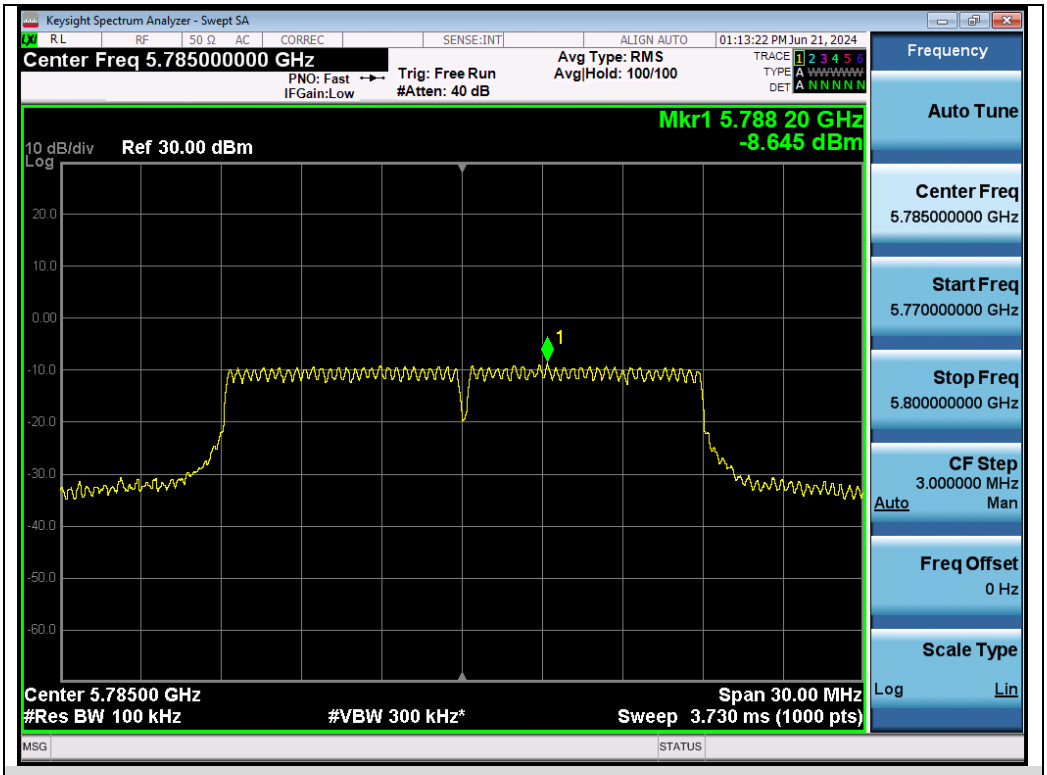

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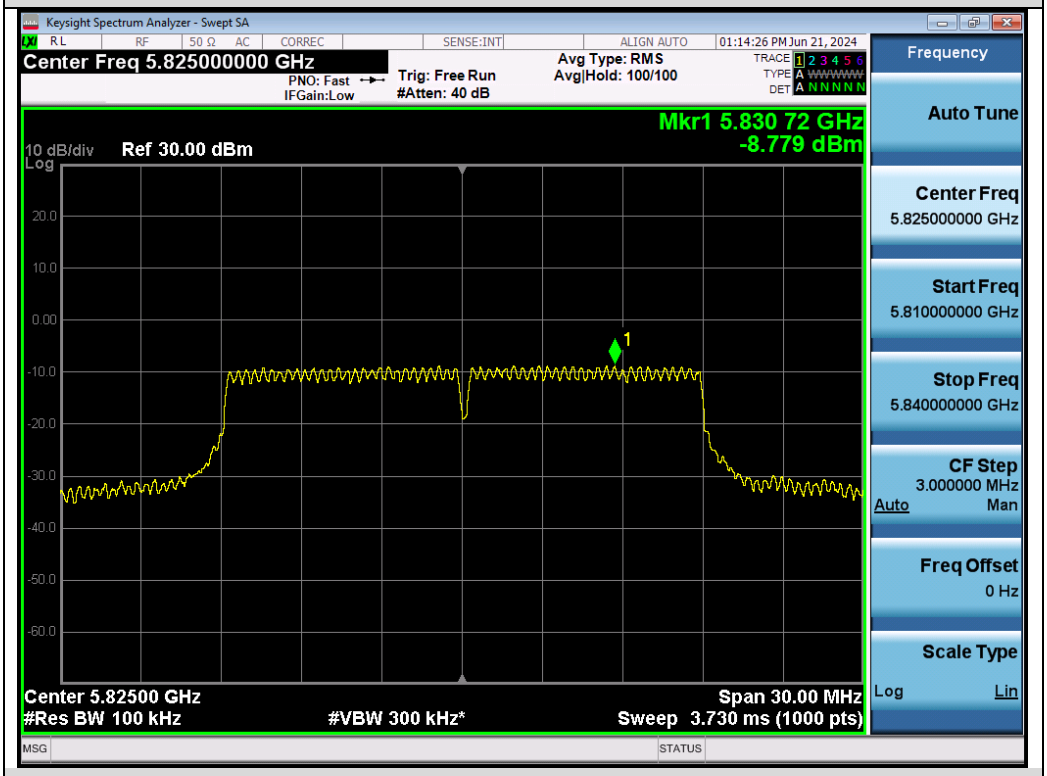

Test_Graph_802.11n20_ANT1_5825_MCS0_PSD

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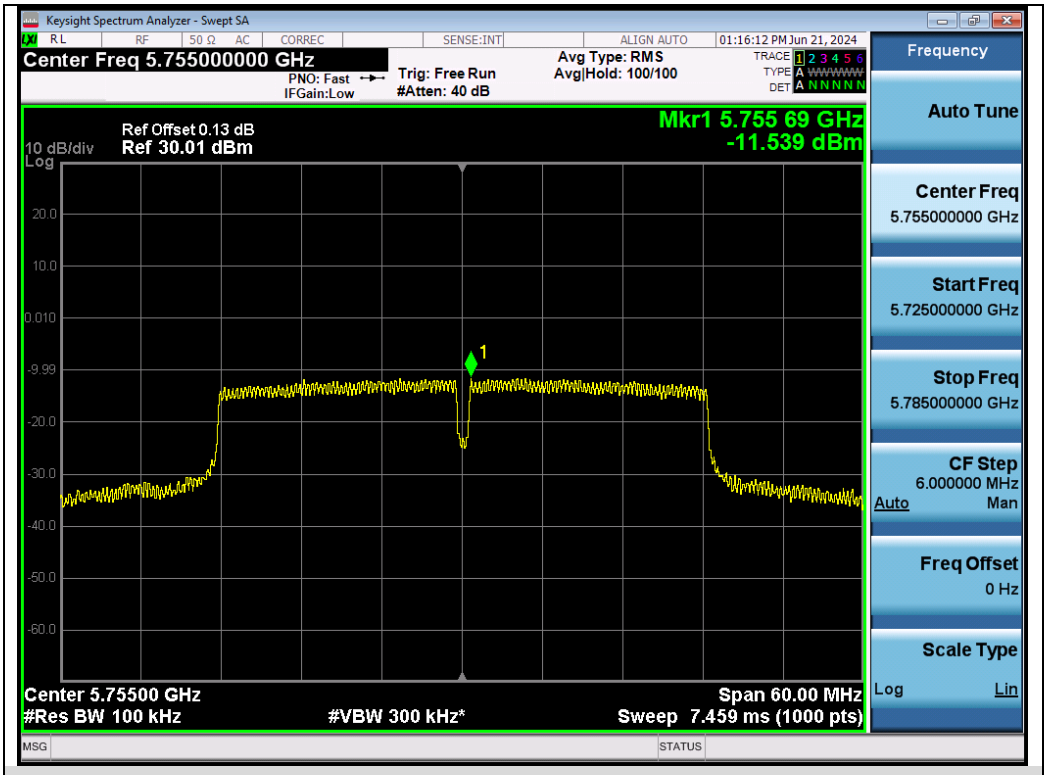
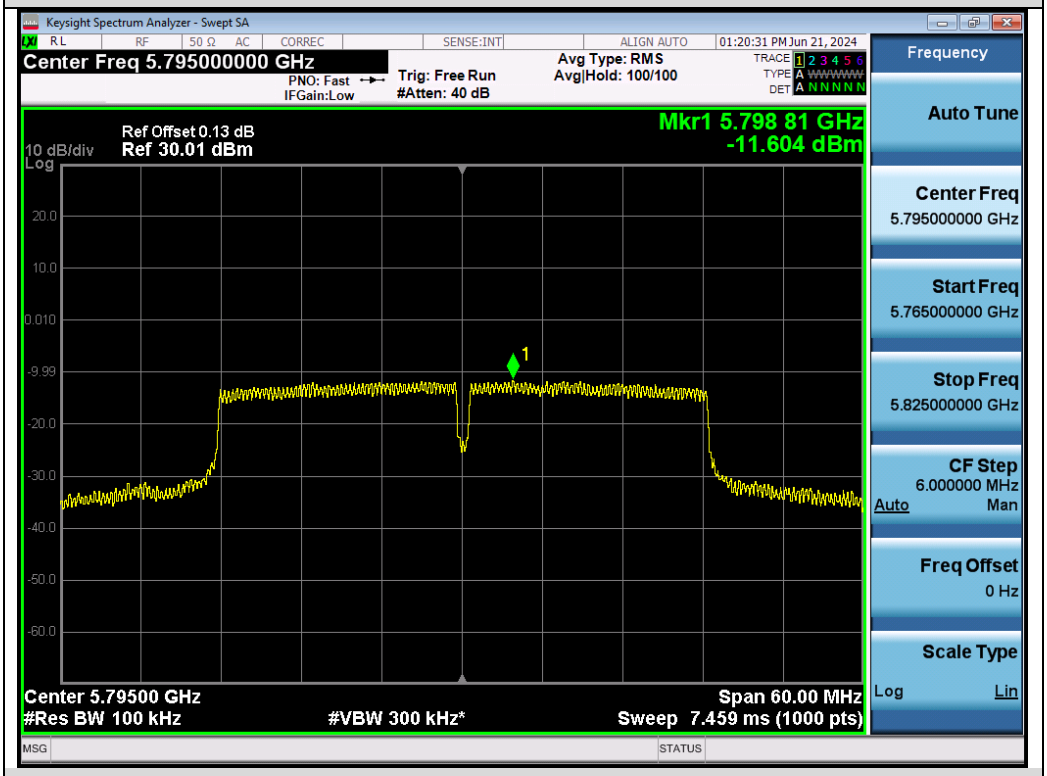


Test_Graph_802.11n40_ANT1_5755_MCS0_PSD



Test_Graph_802.11n40_ANT1_5795_MCS0_PSD

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10. Conducted Band Edge and Out-of-Band Emissions

10.1 Provisions Applicable

	Applicable to	Limit	
Restricted bands	789033 D02 General UNII Test Procedures New Rules v02r01	Field strength at 3m (dBuV/m)	
		PK: 74	AV: 54
Out of the restricted bands	Applicable to	EIRP Limit (dBm/MHz)	Equivalent field Strength at 3m (dBuV/m)
	FCC 15.407(b)(1)	PK: -27	PK: 68.2
	15.407(b)(2)		
	15.407(b)(3)		
	15.407(b)(4)	See Note 2	

Note 1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

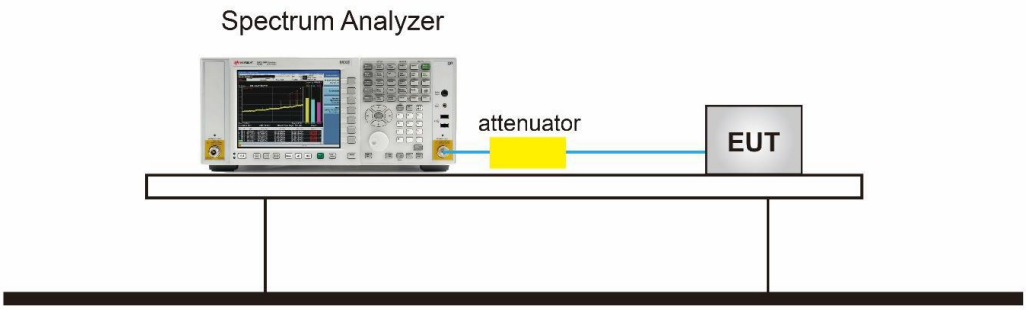
$$E = \frac{1000000 \quad \sqrt{30\ P}}{3} \quad \mu V/m, \text{ where P is the eirp (Watts).}$$

Note 2: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

10.2 Measurement Procedure

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.
4. RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.(Test frequency below 1GHz)
5. RBW = 1 MHz; VBW= 3 MHz; Sweep = auto; Detector function = peak.(Test frequency Above 1GHz)
6. Set SPA Trace 1 Max hold, then View.
7. Mark the maximum useless stray point and compare it with the limit value to record the result.

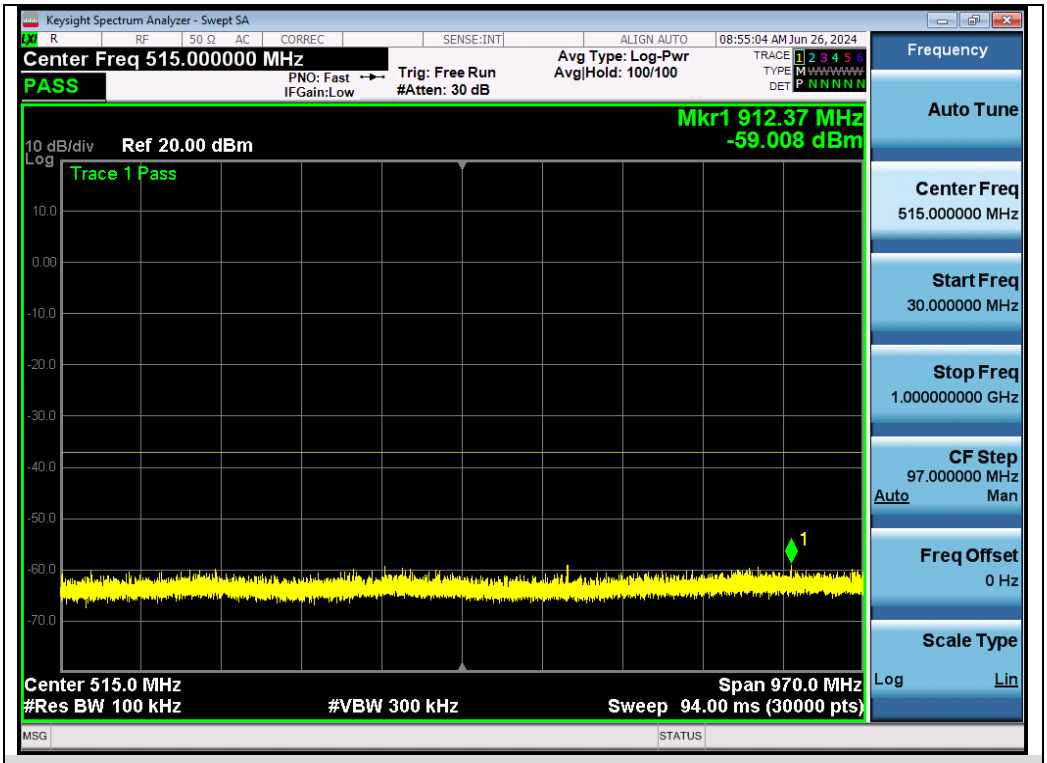
10.3 Measurement Setup (Block Diagram of Configuration)



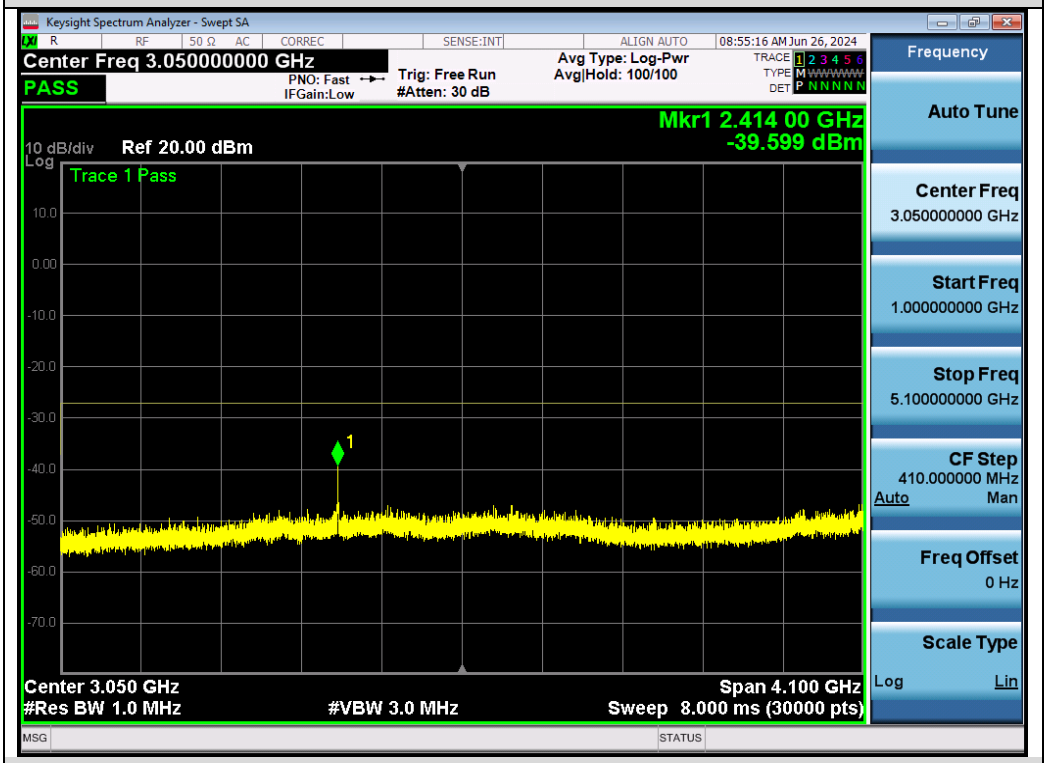
Any report havi g/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

10.4 Measurement Results

Test Graphs of Spurious Emissions outside of the 5.15-5.25 GHz band for transmitters operating in the 5.15-5.25 GHz band



Test_Graph_802.11a_ANT1_5180_6Mbps_Frequency Band 1



Test_Graph_802.11a_ANT1_5180_6Mbps_Frequency Band 2

Any report having no ... esting/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Test_Graph_802.11a_ANT1_5180_6Mbps_Frequency Band 3

Test_Graph_802.11a_ANT1_5180_6Mbps_Frequency Band 4

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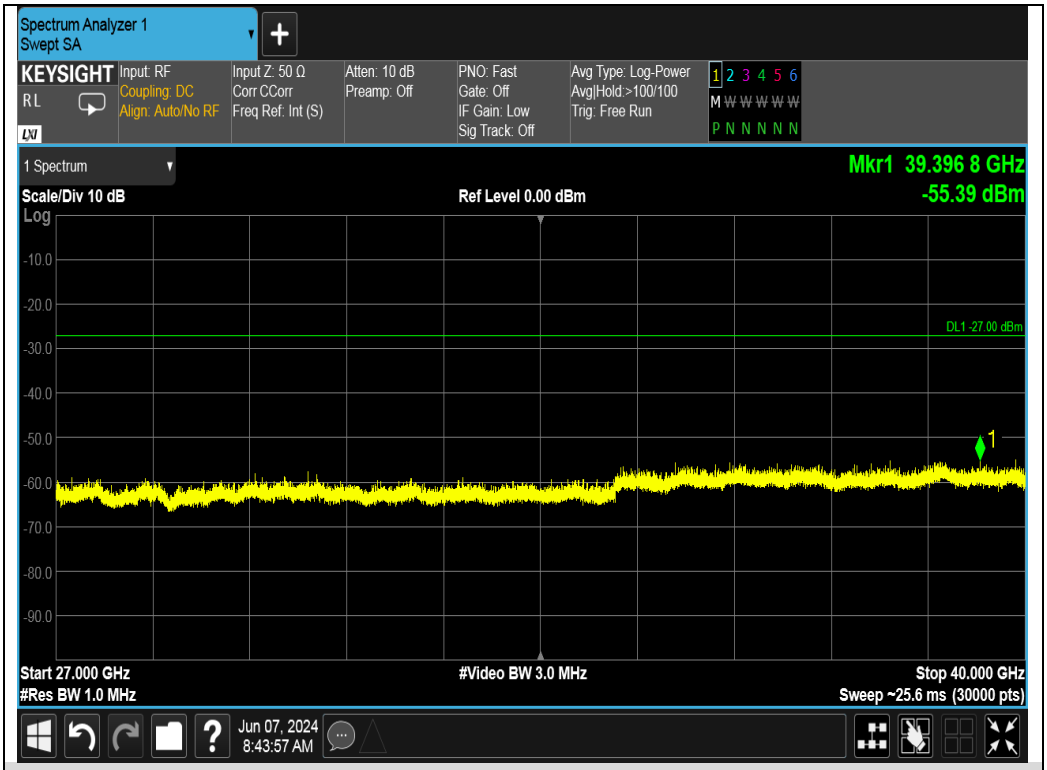
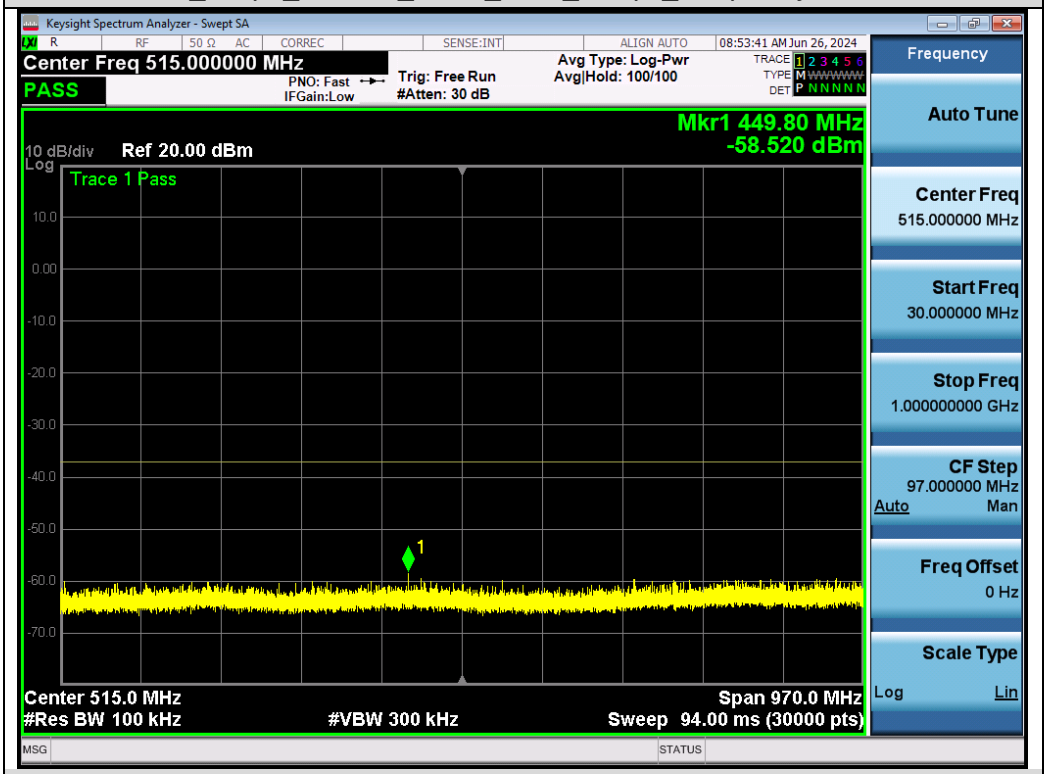


Test_Graph_802.11a_ANT1_5180_6Mbps_Frequency Band 5



Test_Graph_802.11a_ANT1_5240_6Mbps_Frequency Band 1

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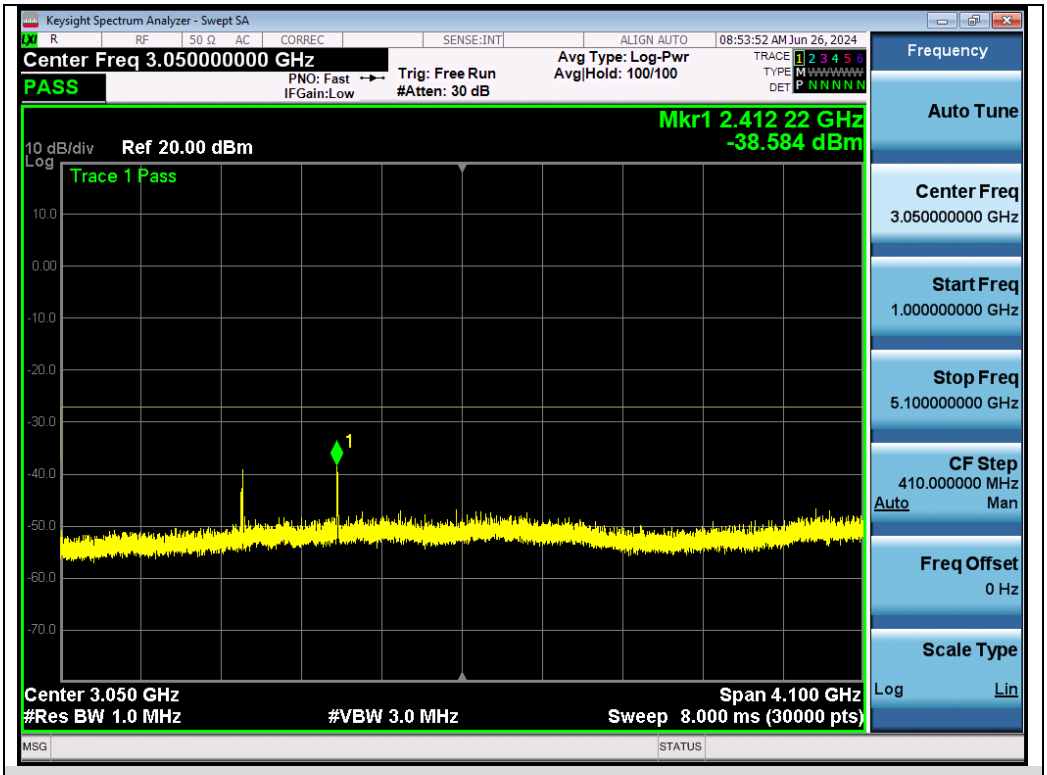
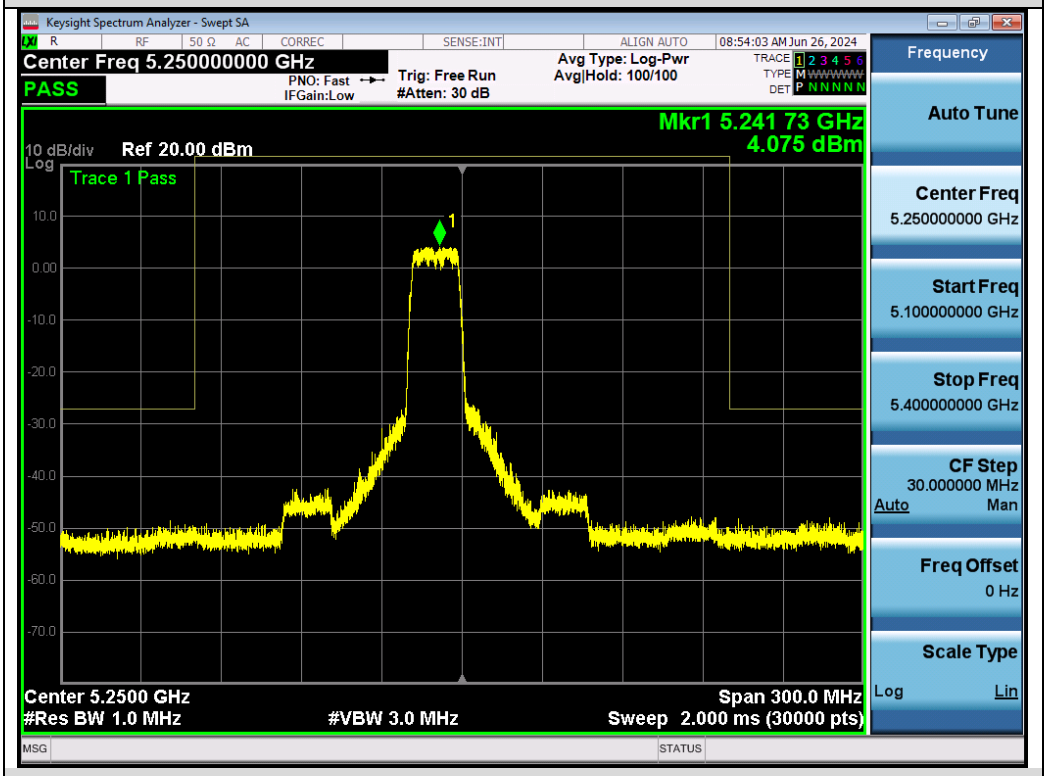


Test_Graph_802.11a_ANT1_5240_6Mbps_Frequency Band 2



Test_Graph_802.11a_ANT1_5240_6Mbps_Frequency Band 3

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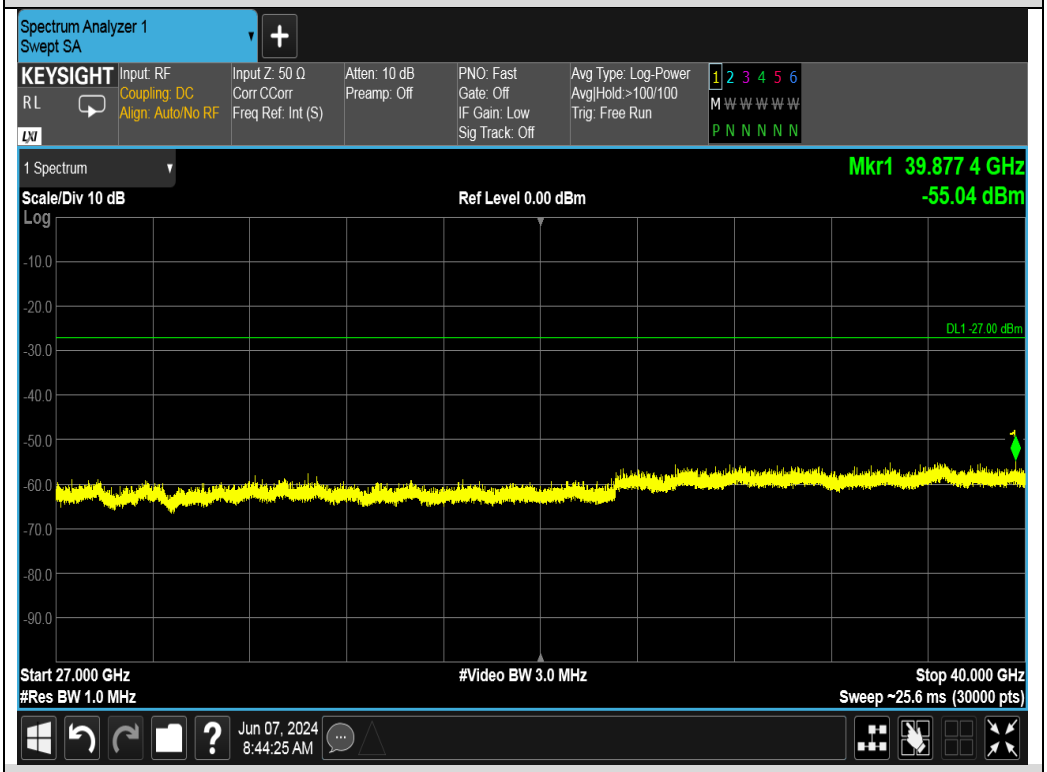
Test_Graph_802.11a_ANT1_5240_6Mbps_Frequency Band 4



Test_Graph_802.11a_ANT1_5240_6Mbps_Frequency Band 5

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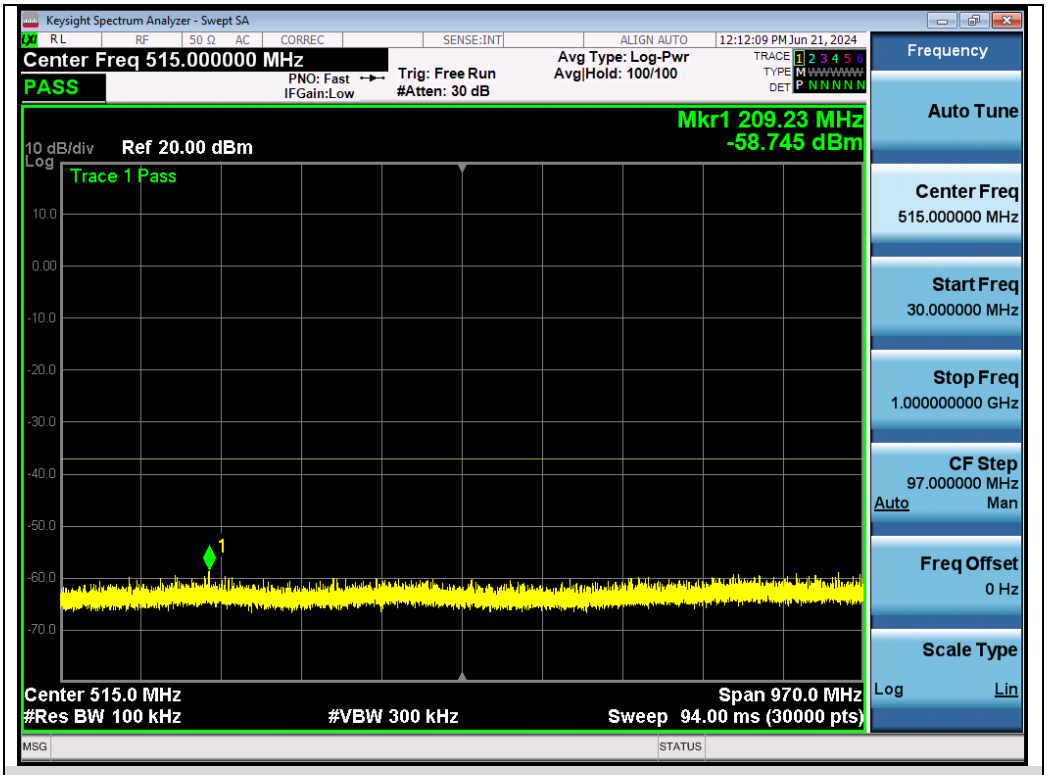
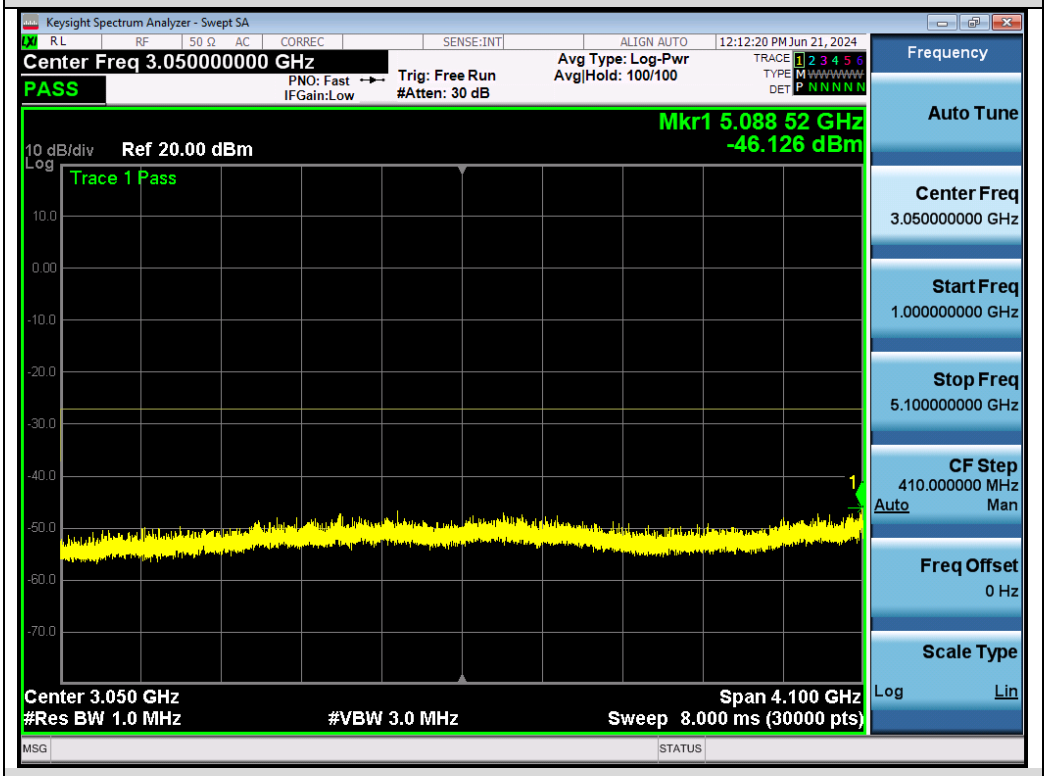


Test_Graph_802.11n20_ANT1_5180_MCS0_Frequency Band 1



Test_Graph_802.11n20_ANT1_5180_MCS0_Frequency Band 2

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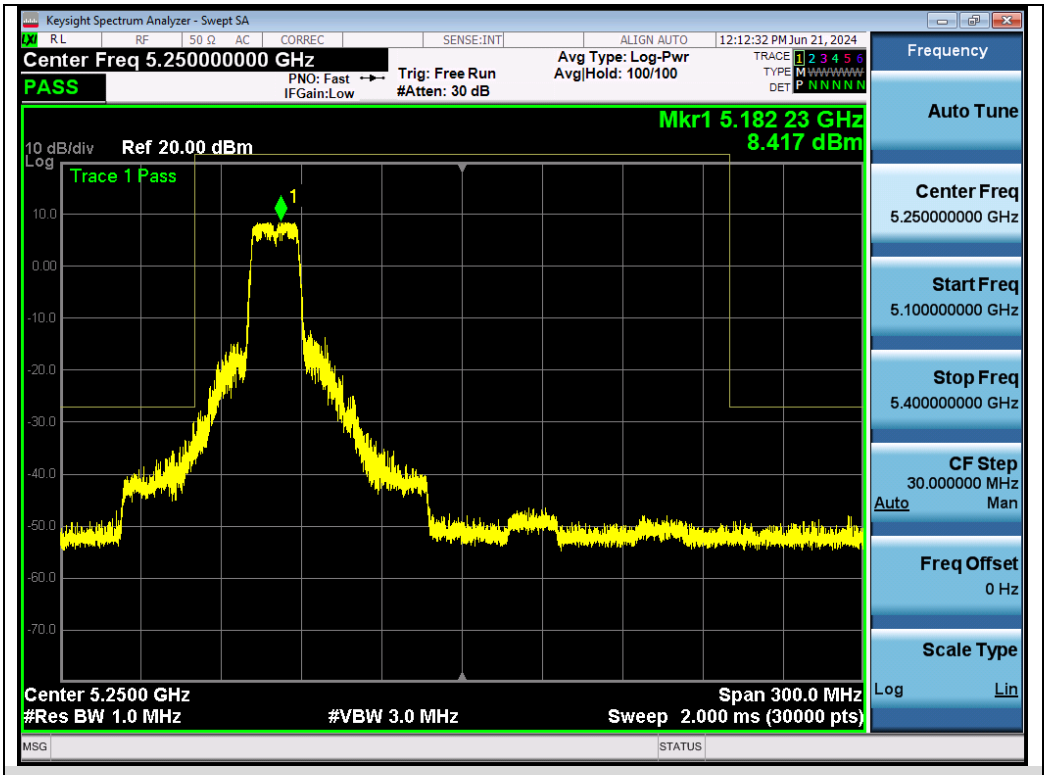

Test_Graph_802.11n20_ANT1_5180_MCS0_Frequency Band 3

Test_Graph_802.11n20_ANT1_5180_MCS0_Frequency Band 4

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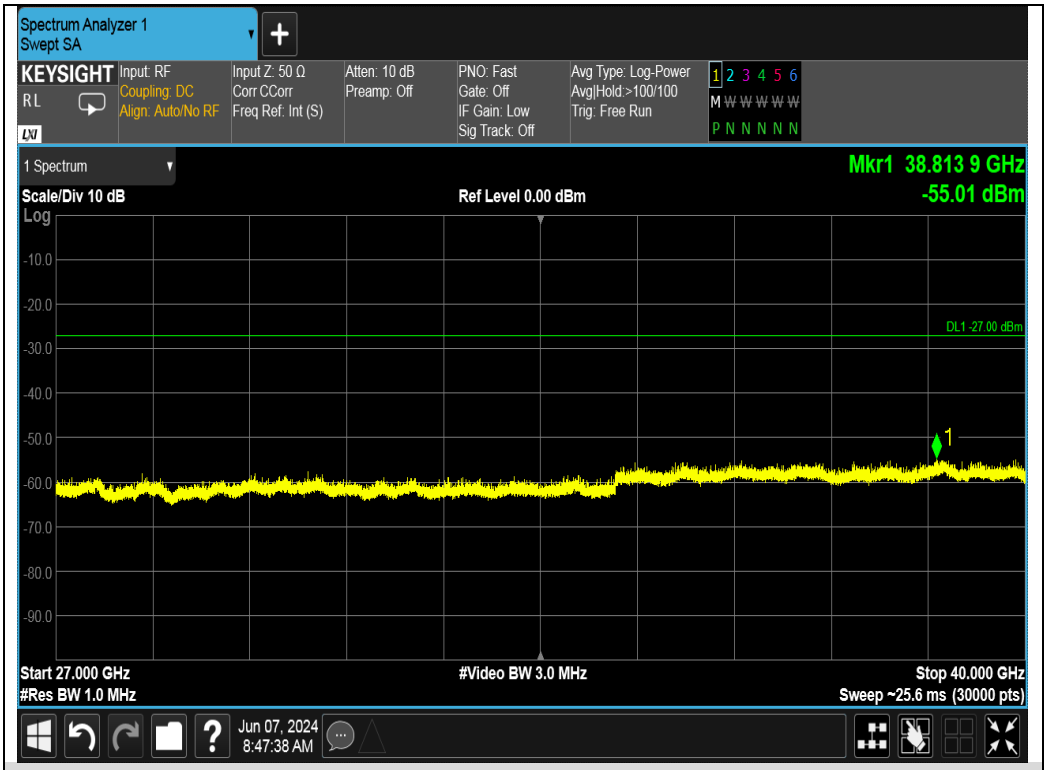
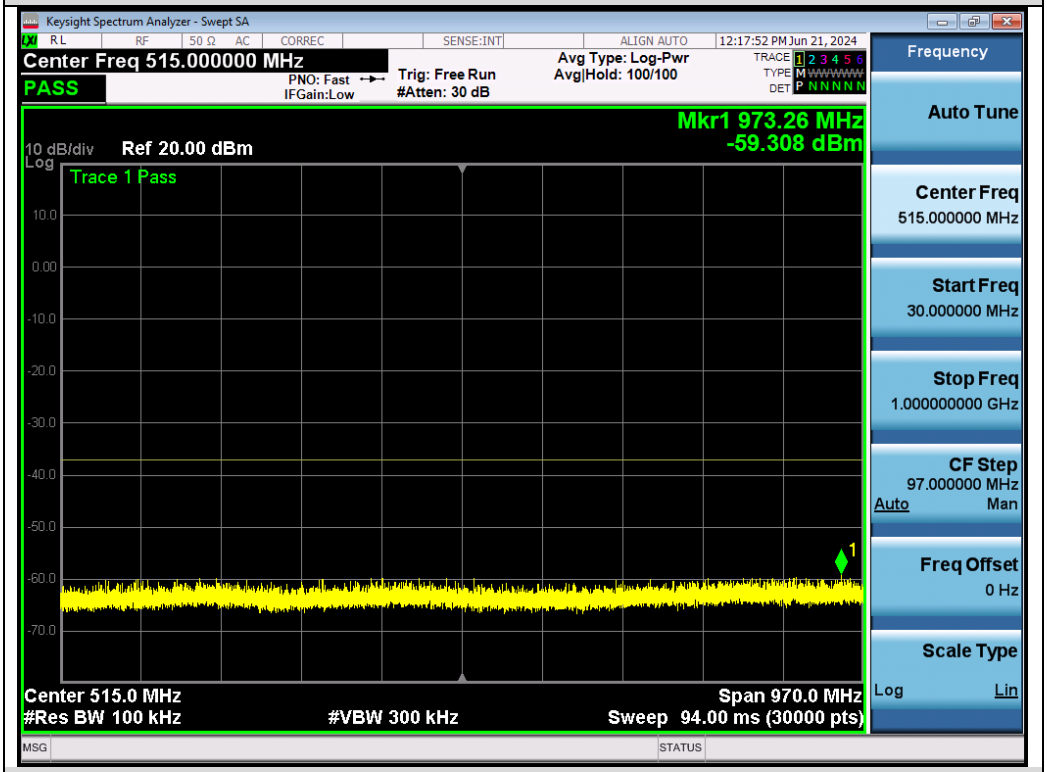


Test_Graph_802.11n20_ANT1_5180_MCS0_Frequency Band 5



Test_Graph_802.11n20_ANT1_5240_MCS0_Frequency Band 1

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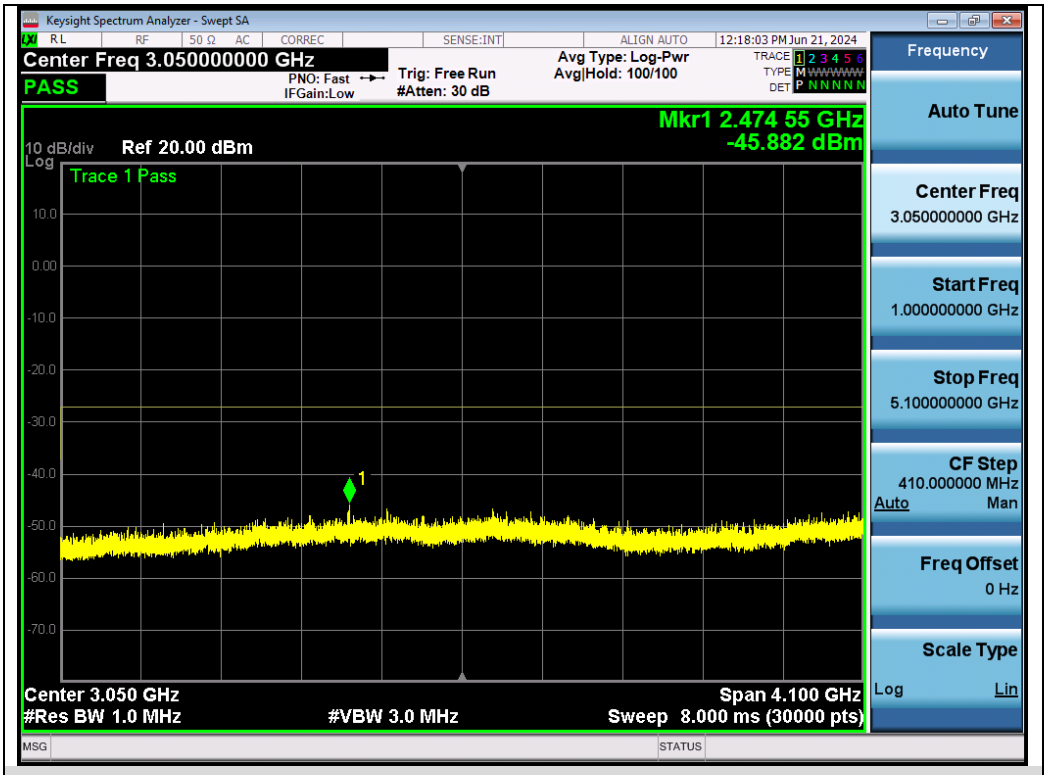
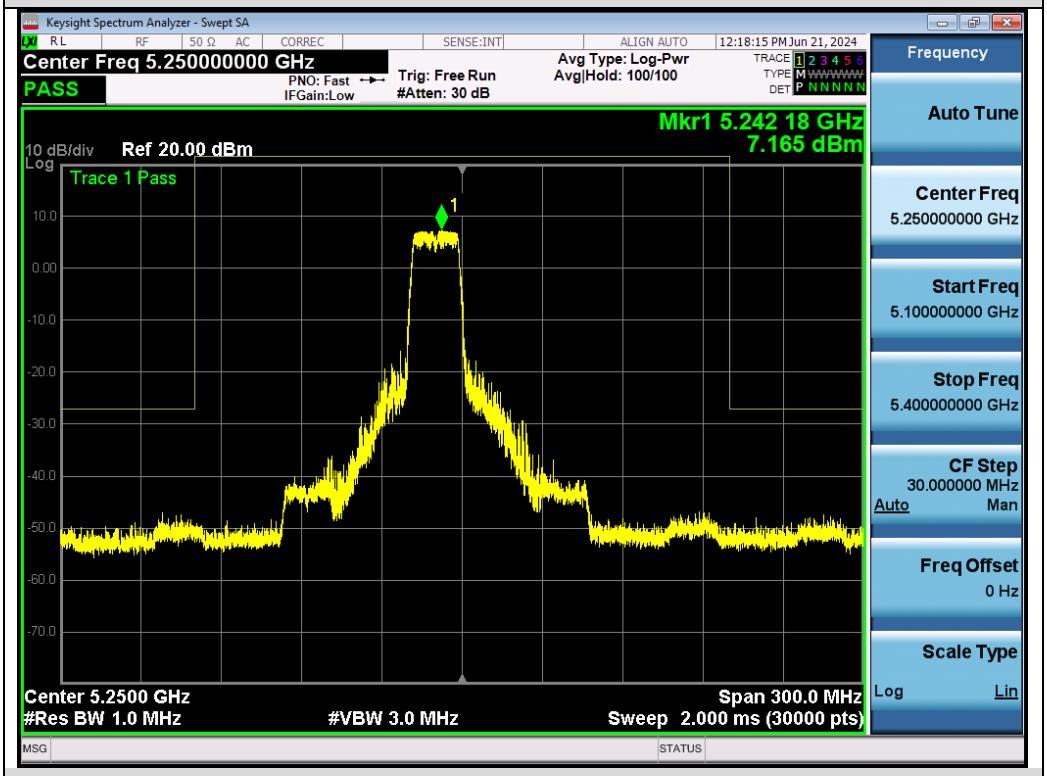


Test_Graph_802.11n20_ANT1_5240_MCS0_Frequency Band 2



Test_Graph_802.11n20_ANT1_5240_MCS0_Frequency Band 3

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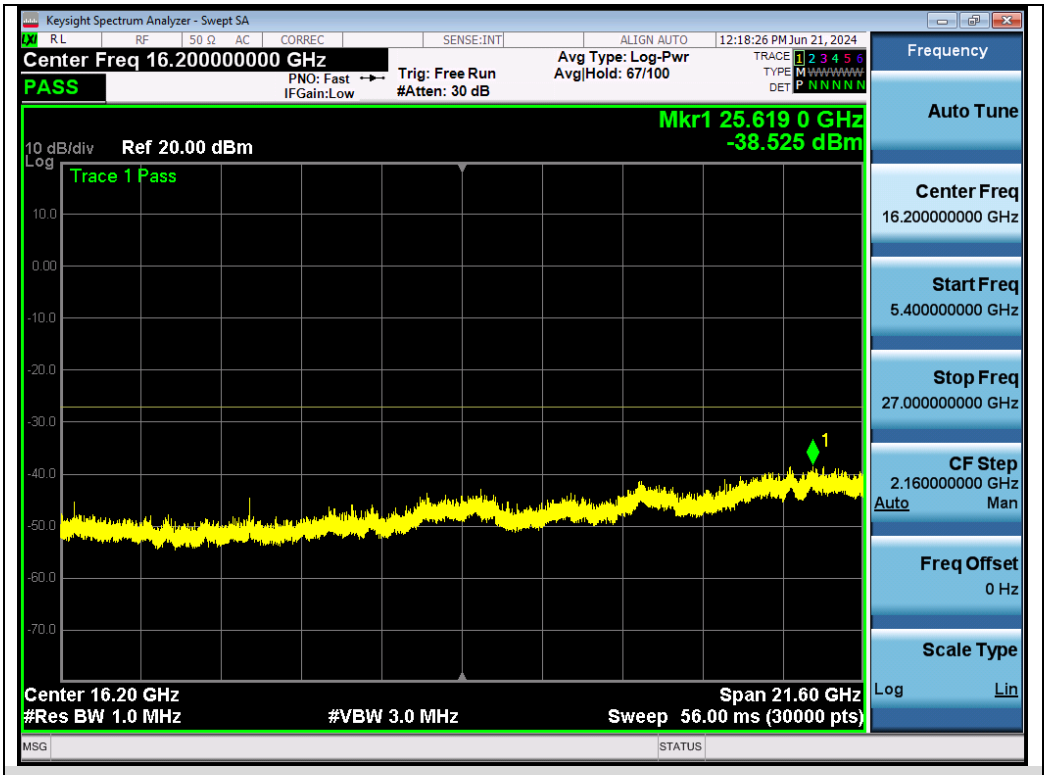
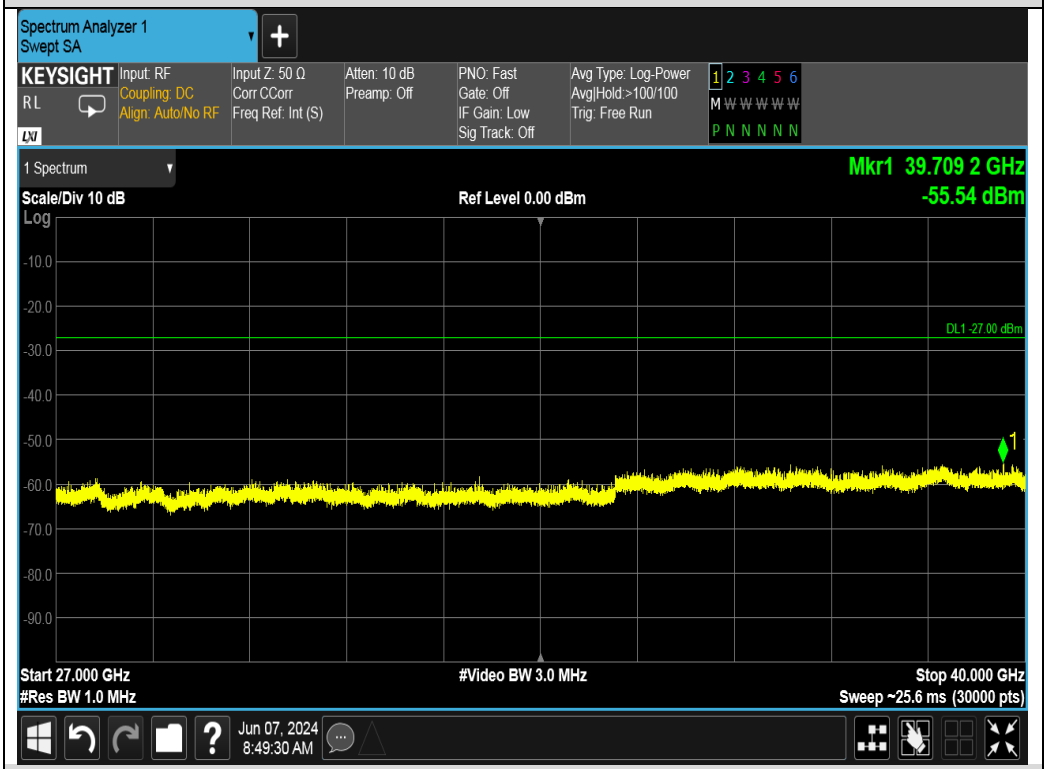


Test_Graph_802.11n20_ANT1_5240_MCS0_Frequency Band 4



Test_Graph_802.11n20_ANT1_5240_MCS0_Frequency Band 5

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