RF TEST REPORT

Applicant	Nokia Shanghai Bell Co., Ltd.
FCC ID	2ADZRG2426GA
Product	7368 ISAM ONT
Model	G-2426G-A
Report No.	R2007B0119-R1V1
Issue Date	September 27, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by:: Peng Tao *Approved by: Kai Xu*

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000

TABLE OF CONTENT

1. Test Laboratory 5
1.1. Notes of the test report 5
1.2. Test facility 5
1.3. Testing Location 5
2. General Description of Equipment under Test 6
2.1. Applicant and Manufacturer Information 6
2.2. General information 6
3. Applied Standards 8
4. Test Configuration 9
5. Test Case Results 11
5.1. Maximum output power 11
5.2. 99% Bandwidth and 6dB Bandwidth 14
5.3. Band Edge 22
5.4. Power Spectral Density 26
5.5. Spurious RF Conducted Emissions 42
5.6. Unwanted Emission 47
5.7. Conducted Emission 93
6. Main Test Instruments 96

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Version	Revision description	Issue Date
Rev.0	/	September 11, 2020
Rev.1	Update information in Page 1	September 27, 2020
Note This revised report (Report No. R2007B0119-R1V1) supersedes and replaces the previously issued report (Report No. R2007B0119-R1). Please discard or destroy the previously issued report and dispose of it accordingly.		

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Summary of measurement results

Number	Test Case	Clause in FCC rules	Verdict
1	Maximum conducted output power	15.247(b)(3)	PASS
2	6 dB bandwidth	15.247(a)(2)	PASS
3	Power spectral density	15.247(e)	PASS
4	Band Edge	15.247(d)	PASS
5	Spurious RF Conducted Emissions	15.247(d)	PASS
6	Unwanted Emissions	15.247(d),15.205,15.209	PASS
7	Conducted Emissions	15.207	PASS
Date of Testing: July 13, 2020~ August 31, 2020			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

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1. Test Laboratory

1.1. Notes of the test report

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1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

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2. General Description of Equipment under Test

2.1. Applicant and Manufacturer Information

Applicant	Nokia Shanghai Bell Co., Ltd.
Applicant address	No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China
Manufacturer	T&W
Manufacturer address	89# Jiang Nan Road, Loudong Street,Taicang , Shanghai, China

2.2. General information

EUT Description					
Model	G-2426G-A				
SN	1#				
Hardware Version	3FE49241AAAA				
Software Version	3FE49226HJHK49				
Power Supply	AC adapter				
Antenna Type	Internal Antenna				
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)				
Antenna Gain	Antenna 1: 3.00 dBi Antenna 2: 3.00 dBi				
Directional Gain	Without Beamforming Mode for Power	Frequency(MHz)	2400	2450	2500
		Directional Gain(dBi)	3.1	3.4	3.3
	Without Beamforming Mode for PSD	Frequency(MHz)	2400	2450	2500
		Directional Gain(dBi)	6.1	6.4	6.3
	Beamforming Mode	Frequency(MHz)	2400	2450	2500
		Directional Gain(dBi)	4.8	4.8	4.8
Test Mode	802.11b 802.11g, 802.11n(HT20/HT40); 802.11ax (HE20/HE40);				
Modulation Type	802.11b: DSSS; 802.11g/n(HT20/HT40): OFDM 802.11ax (HE20/HE40):OFDMA, OFDM				
Max. Conducted Power	Wi-Fi 2.4G :25.14dBm				
Operating Frequency Range(s)	802.11b/g/n(HT20): 2412 ~ 2462 MHz 802.11n(HT40): 2422 ~ 2452 MHz				

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	802.11ax (HE20): 2412 ~ 2462 MHz 802.11ax (HE40): 2422 ~ 2452 MHz
EUT Accessory	
Adapter 1	Manufacturer: Dongguan Shilong Fuhua Electronic Co., Ltd. Model: UES24WU-120200SPA
Adapter 2	Manufacturer: RUIDE(SHENZHEN) ELECTRONIC INDUSTRIAL CO., LTD. Model: RD1202000-C55-154MG
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.	

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3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 15C (2019) Radio Frequency Devices

ANSI C63.10 (2013)

Reference standard:

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

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4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the loop antenna is vertical, the others are vertical and horizontal. and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Band	Data Rate
	MIMO
802.11b	/
802.11g	/
802.11n HT20	MCS8
802.11n HT40	MCS8
802.11ax (HE20)	MCS8
802.11ax (HE40)	MCS8

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The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	MIMO
Maximum conducted output power	O
99% Bandwidth and 6dB Bandwidth	O
Band Edge	O
Power Spectral Density	O
Spurious RF Conducted Emissions	O
Unwanted Emissions	O
Conducted Emission	802.11ax (HE20)

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5. Test Case Results

5.1. Maximum output power

Ambient condition

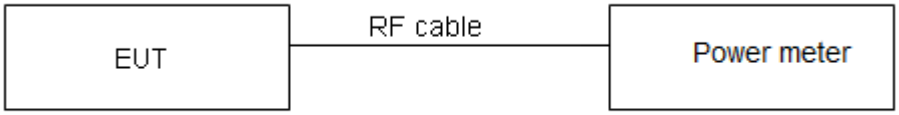
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to Power meter with a known loss. The EUT is max power transmission with proper modulation.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test Setup



Limits

Rule Part 15.247 (b) (3) specifies that " For systems using digital modulation in the 2400–2483.5 MHz, 2400–2483.5 MHz: 1 Watt."

Average Output Power	≤ 1W (30dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

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Test Results

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	8.42	8.48	0.99	NA
802.11g	1.39	1.46	0.96	0.20
802.11n HT20	1.28	1.34	0.95	0.21
802.11ax HE20	1.02	1.07	0.95	0.23
802.11n HT40	0.64	0.69	0.92	0.37
802.11ax HE40	0.54	0.59	0.91	0.43
Note: when Duty cycle>0.98, Duty cycle correction Factor not required.				

MIMO

Without Beamforming

Network Standards	Carrier frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11b HT20	2412	18.97	18.97	18.17	18.17	21.60	30.00	PASS
	2437	20.24	20.24	19.78	19.78	23.03	30.00	PASS
	2462	18.35	18.35	18.12	18.12	21.25	30.00	PASS
802.11g HT20	2412	18.53	18.73	18.22	18.42	21.58	30.00	PASS
	2437	22.03	22.23	21.67	21.87	25.06	30.00	PASS
	2462	18.53	18.73	18.23	18.43	21.59	30.00	PASS
802.11n HT20	2412	18.56	18.77	18.31	18.52	21.66	30.00	PASS
	2437	21.84	22.05	21.48	21.69	24.89	30.00	PASS
	2462	18.61	18.82	18.37	18.58	21.71	30.00	PASS
802.11ax HE20	2412	18.65	18.88	17.87	18.10	21.52	30.00	PASS
	2437	21.94	22.17	21.75	21.98	25.09	30.00	PASS
	2462	18.83	19.06	18.02	18.25	21.69	30.00	PASS
802.11n HT40	2422	18.44	18.81	18.18	18.55	21.69	30.00	PASS
	2437	20.22	20.59	19.89	20.26	23.43	30.00	PASS
	2452	19.32	19.69	19.11	19.48	22.59	30.00	PASS
802.11ax HE40	2422	18.96	19.39	18.03	18.46	21.96	30.00	PASS
	2437	21.84	22.27	21.56	21.99	25.14	30.00	PASS
	2452	18.93	19.36	18.66	19.09	22.24	30.00	PASS

Note: 1.Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}$.

3. Directional gain <6dBi. So the power limt is 30dBm.

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With Beamforming

Network Standards	Carrier frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11b HT20	2412	18.92	18.92	18.12	18.12	21.55	30.00	PASS
	2437	20.21	20.21	19.73	19.73	22.99	30.00	PASS
	2462	18.33	18.33	18.10	18.10	21.23	30.00	PASS
802.11g HT20	2412	18.51	18.71	18.13	18.33	21.53	30.00	PASS
	2437	22.02	22.22	21.57	21.77	25.01	30.00	PASS
	2462	18.51	18.71	18.21	18.41	21.57	30.00	PASS
802.11n HT20	2412	18.43	18.64	18.26	18.47	21.57	30.00	PASS
	2437	21.75	21.96	21.45	21.66	24.82	30.00	PASS
	2462	18.56	18.77	18.33	18.54	21.67	30.00	PASS
802.11ax HE20	2412	18.62	18.85	17.83	18.06	21.49	30.00	PASS
	2437	21.87	22.10	21.71	21.94	25.03	30.00	PASS
	2462	18.78	19.01	18.01	18.24	21.66	30.00	PASS
802.11n HT40	2422	18.41	18.78	18.15	18.52	21.66	30.00	PASS
	2437	20.14	20.51	19.84	20.21	23.37	30.00	PASS
	2452	19.25	19.62	19.03	19.40	22.52	30.00	PASS
802.11ax HE40	2422	18.93	19.36	18.02	18.45	21.94	30.00	PASS
	2437	21.81	22.24	21.53	21.96	25.11	30.00	PASS
	2452	18.89	19.32	18.64	19.07	22.21	30.00	PASS

Note: 1.Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}$.

3.Directional gain <6dBi. So the power limt is 30dBm.

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5.2. 99% Bandwidth and 6dB Bandwidth

Ambient condition

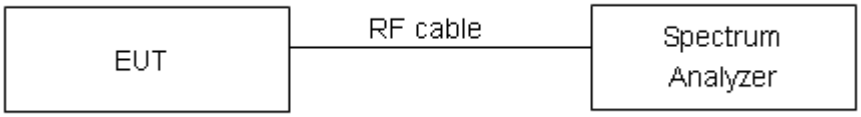
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.
Dector=Peak, Trace mode=max hold.

The EUT was connected to the spectrum analyzer through a known loss cable. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value.

Test Setup



Limits

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

minimum 6 dB bandwidth	≥ 500 kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

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Test Results:

Network Standards	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	12.600	8.073	500	PASS
	2437	12.656	8.061	500	PASS
	2462	12.661	8.042	500	PASS
802.11g	2412	16.453	15.080	500	PASS
	2437	17.335	13.850	500	PASS
	2462	16.464	13.160	500	PASS
802.11n HT20	2412	17.565	15.020	500	PASS
	2437	17.907	15.460	500	PASS
	2462	17.555	14.830	500	PASS
802.11ax HE20	2412	18.929	17.910	500	PASS
	2437	18.976	18.150	500	PASS
	2462	18.916	17.870	500	PASS
802.11n HT40	2422	36.048	35.070	500	PASS
	2437	36.017	31.300	500	PASS
	2452	36.017	35.040	500	PASS
802.11ax HE40	2422	37.630	37.150	500	PASS
	2437	37.766	35.910	500	PASS
	2452	37.631	35.650	500	PASS

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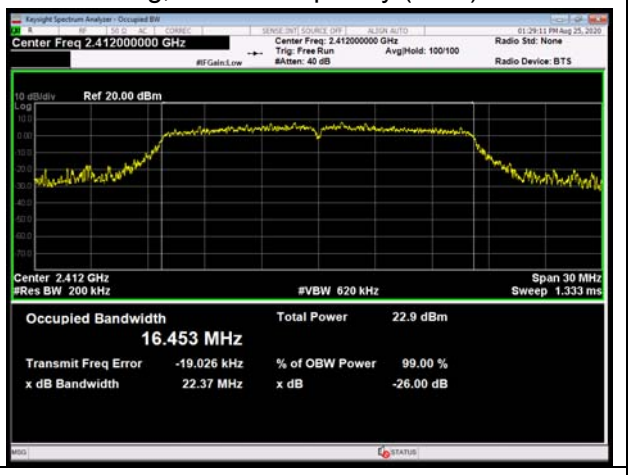
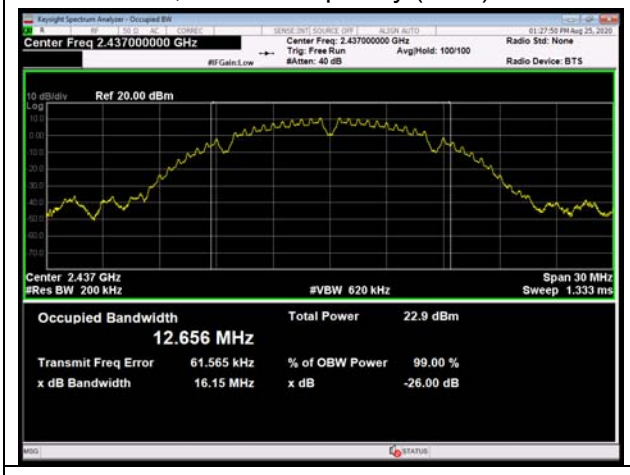
99%bandwidth

802.11b, Carrier frequency (MHz): 2412

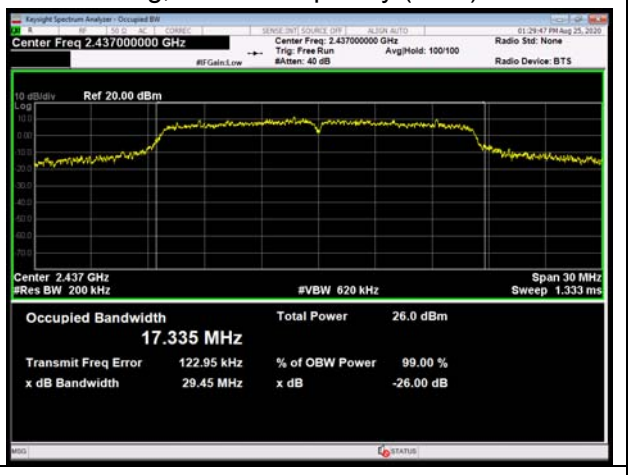
802.11g, Carrier frequency (MHz): 2412



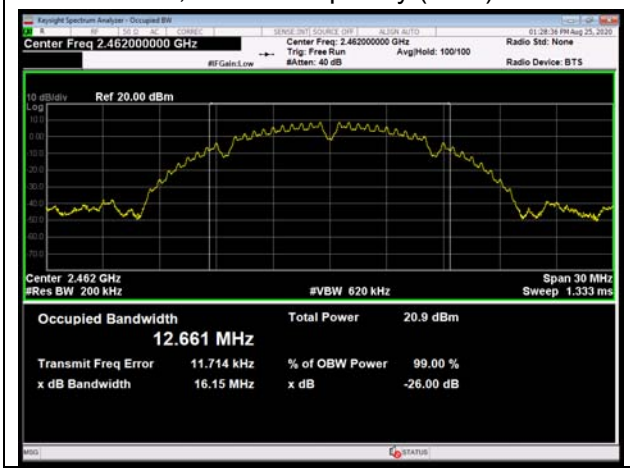
802.11b, Carrier frequency (MHz): 2437



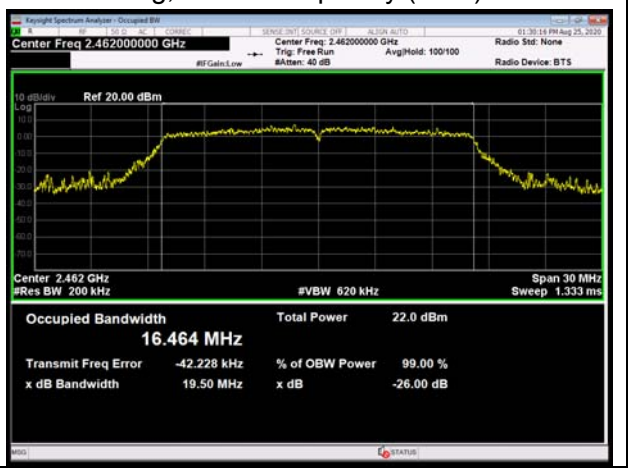
802.11g, Carrier frequency (MHz): 2437



802.11b, Carrier frequency (MHz):2462



802.11g, Carrier frequency (MHz):2462



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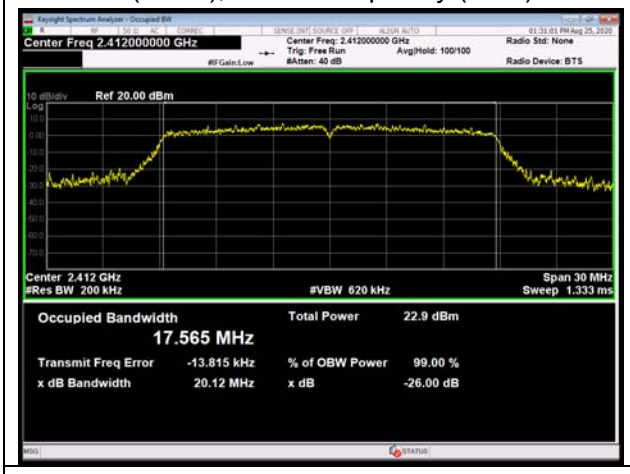
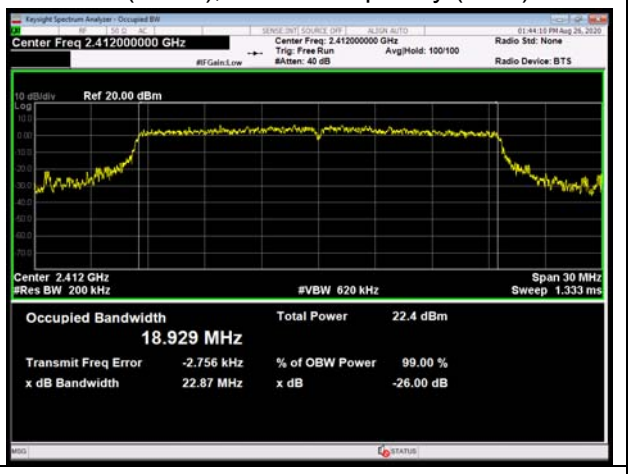
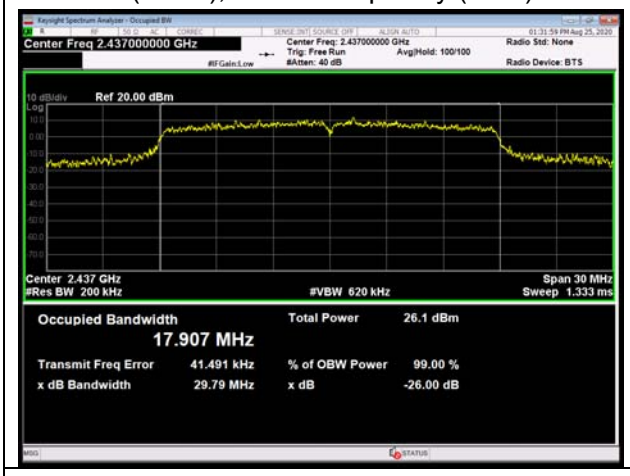
802.11n(HT20), Carrier frequency (MHz): 2412



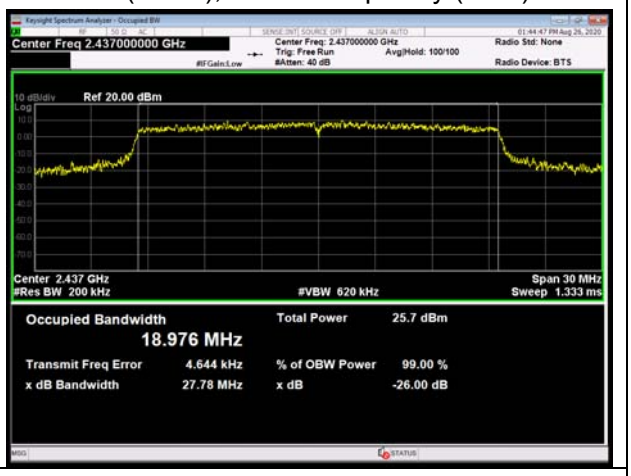
802.11ax(HE20), Carrier frequency (MHz): 2412



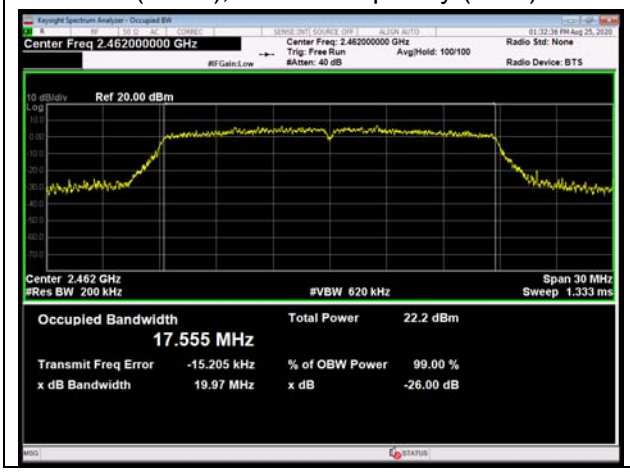
802.11n(HT20), Carrier frequency (MHz): 2437



802.11ax(HE20), Carrier frequency (MHz): 2437



802.11n(HT20), Carrier frequency (MHz):2462



802.11ax(HE20), Carrier frequency (MHz):2462

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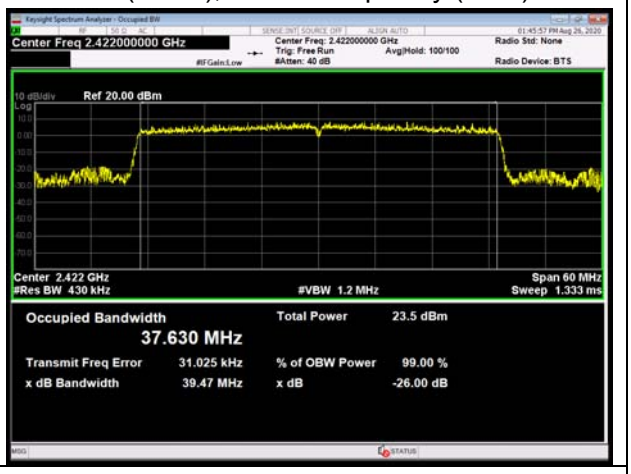
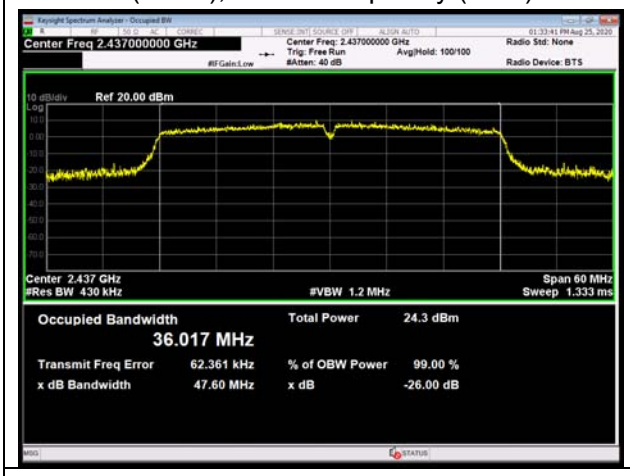
802.11n(HT40), Carrier frequency (MHz): 2422

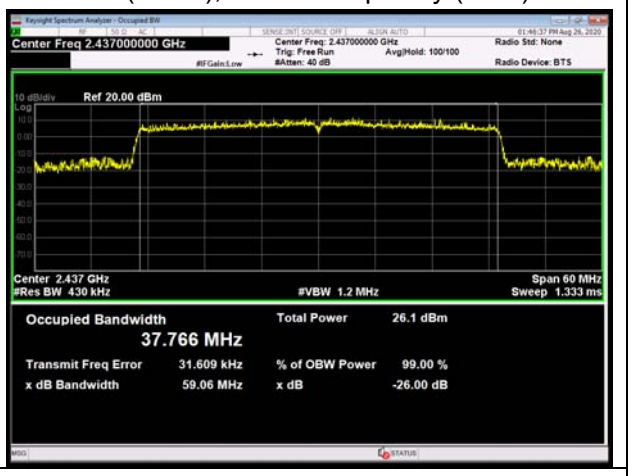
802.11ax(HE40), Carrier frequency (MHz): 2422



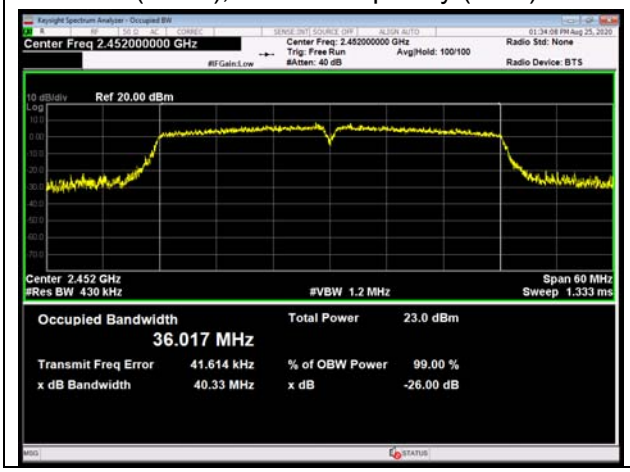
802.11n(HT40), Carrier frequency (MHz): 2437



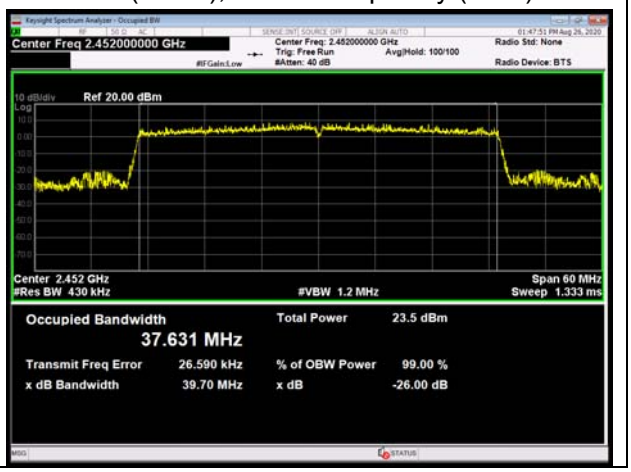
802.11ax(HE40), Carrier frequency (MHz): 2437



802.11n(HT40), Carrier frequency (MHz):2452



802.11ax(HE40), Carrier frequency (MHz):2452



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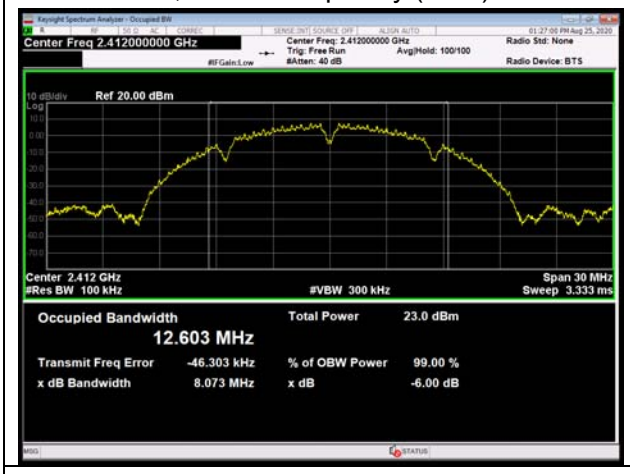
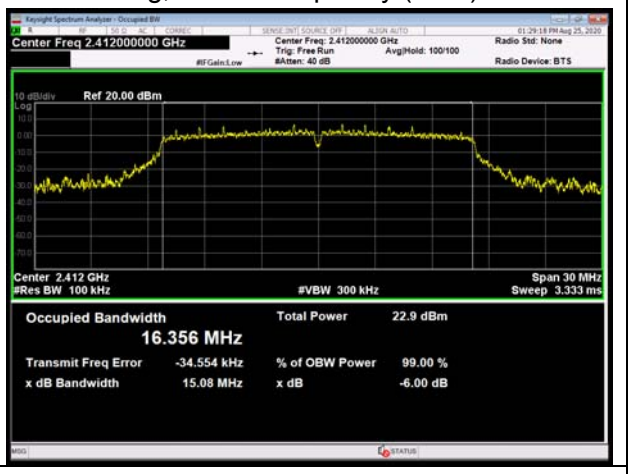
6 dB bandwidth

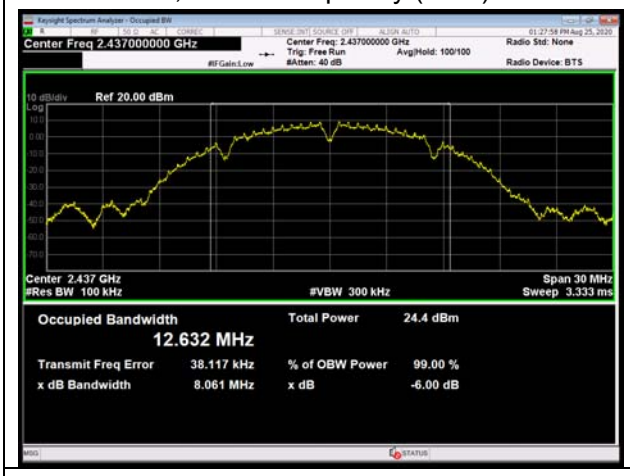
802.11b, Carrier frequency (MHz): 2412



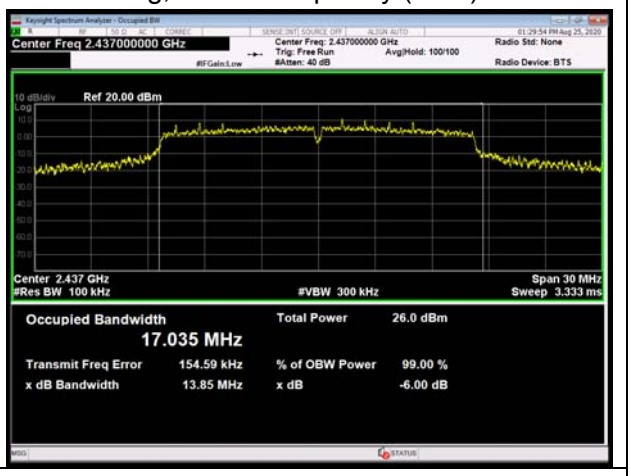
802.11g, Carrier frequency (MHz): 2412



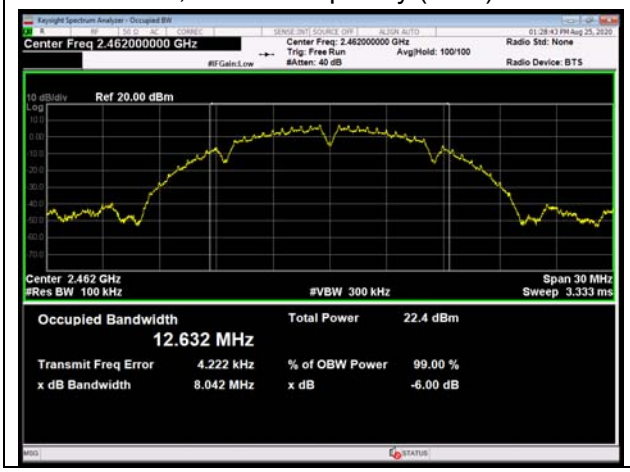
802.11b, Carrier frequency (MHz): 2437



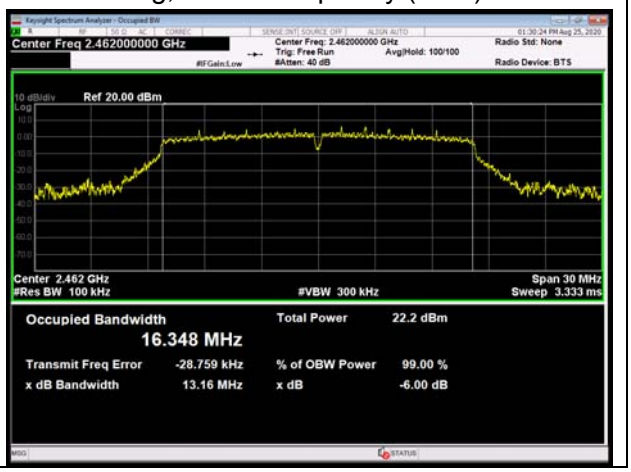
802.11g, Carrier frequency (MHz): 2437



802.11b, Carrier frequency (MHz):2462



802.11g, Carrier frequency (MHz):2462



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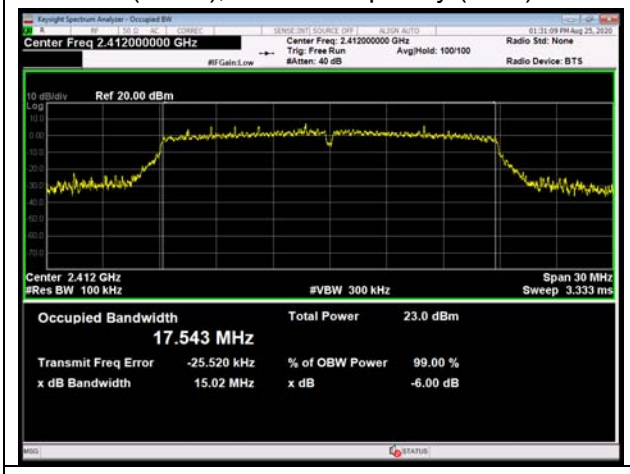
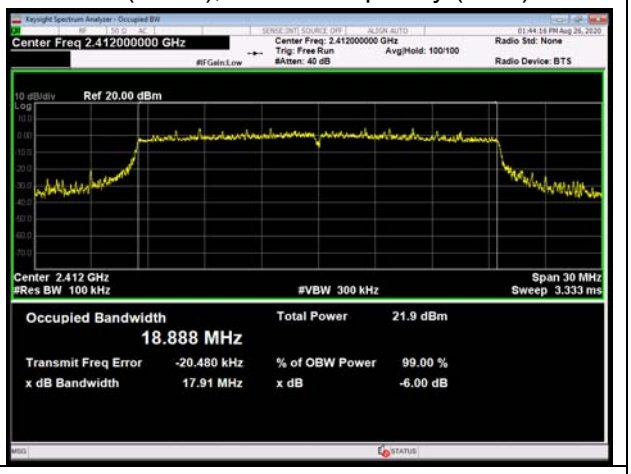
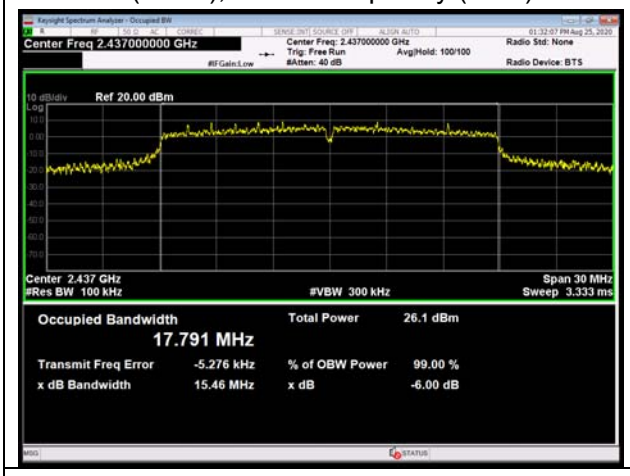
802.11n(HT20), Carrier frequency (MHz): 2412



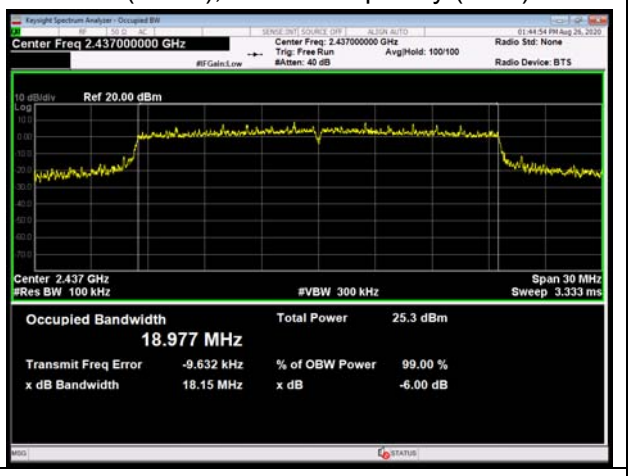
802.11ax(HE20), Carrier frequency (MHz): 2412



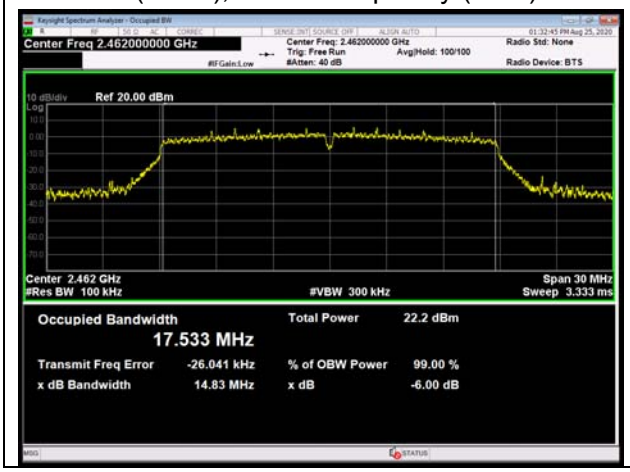
802.11n(HT20), Carrier frequency (MHz): 2437



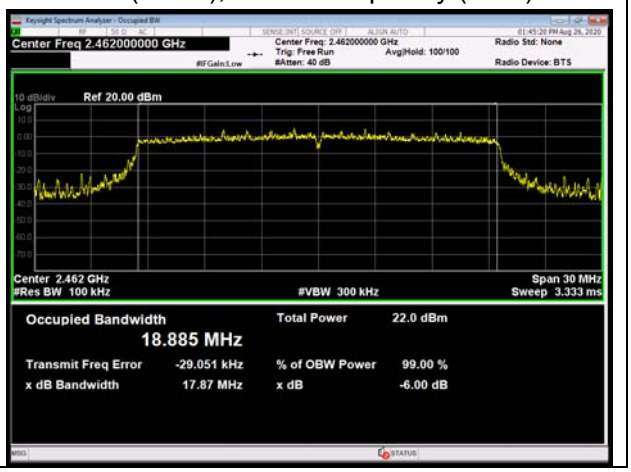
802.11ax(HE20), Carrier frequency (MHz): 2437



802.11n(HT20), Carrier frequency (MHz):2462



802.11ax(HE20), Carrier frequency (MHz):2462



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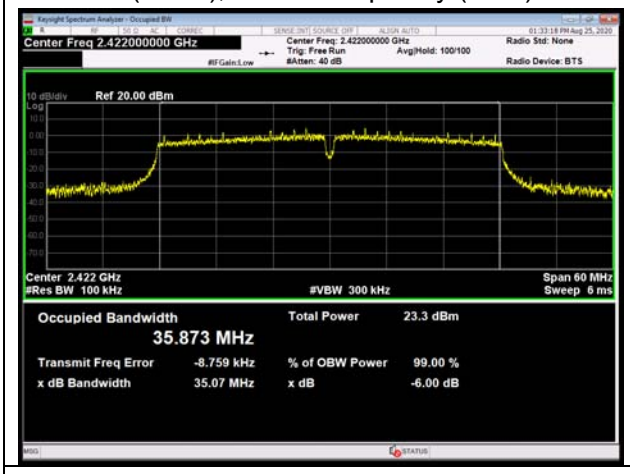
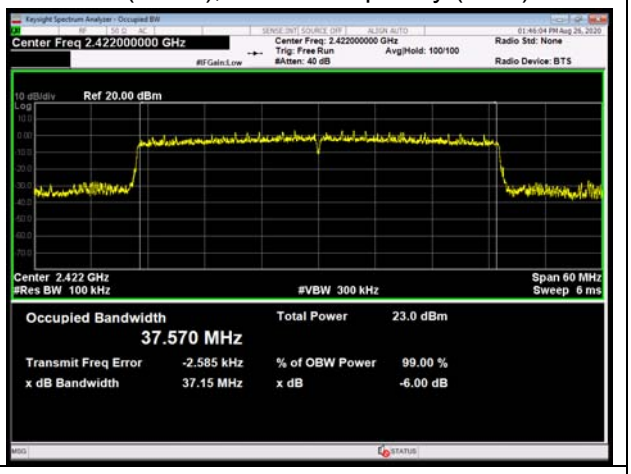
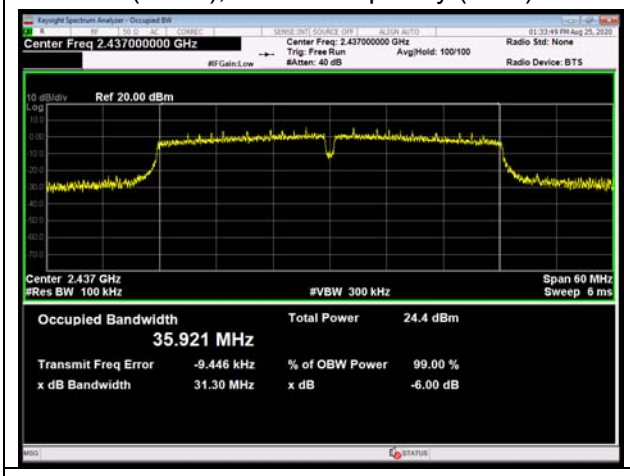
802.11n(HT40), Carrier frequency (MHz): 2422



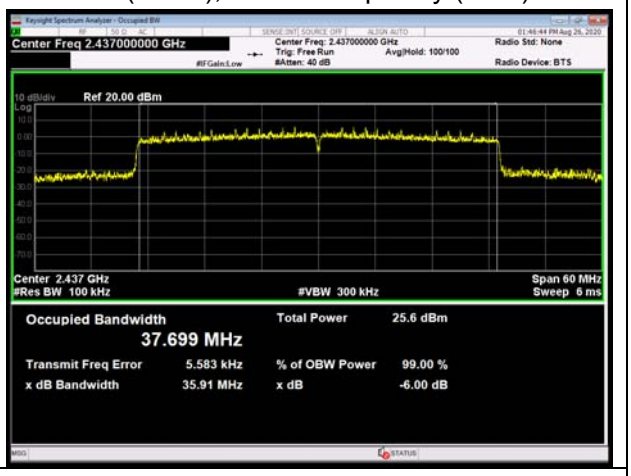
802.11ax(HE40), Carrier frequency (MHz): 2422



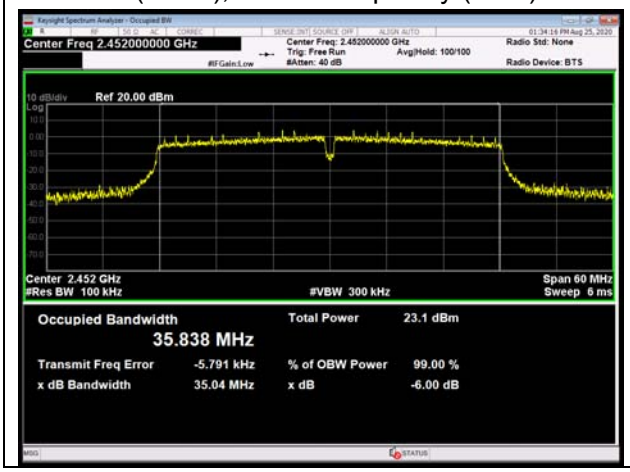
802.11n(HT40), Carrier frequency (MHz): 2437



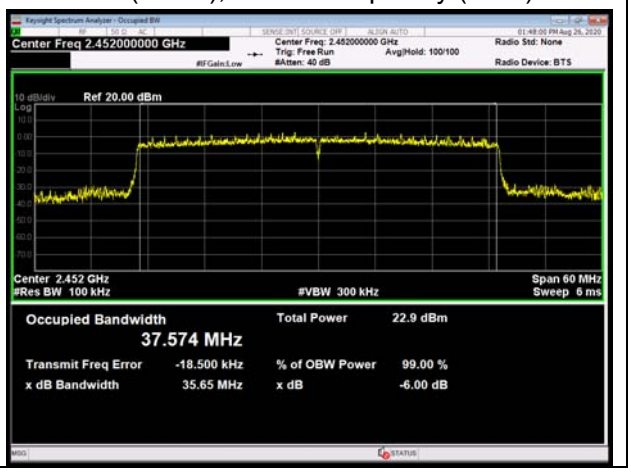
802.11ax(HE40), Carrier frequency (MHz): 2437



802.11n(HT40), Carrier frequency (MHz):2452



802.11ax(HE40), Carrier frequency (MHz):2452



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5.3. Band Edge

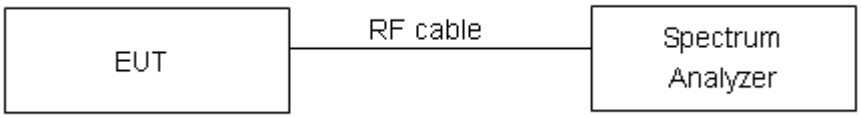
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.” If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.”

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

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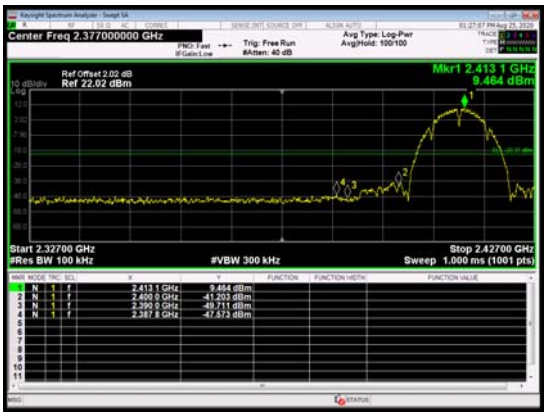
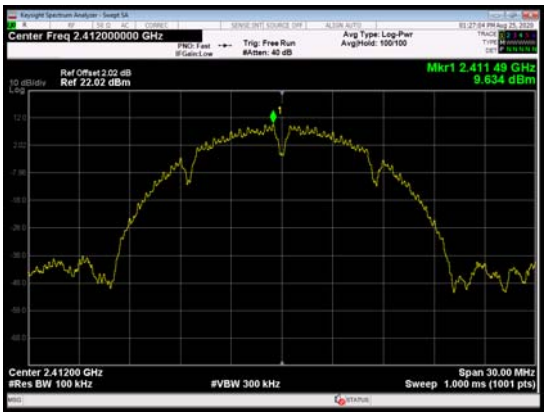
Test Results: PASS

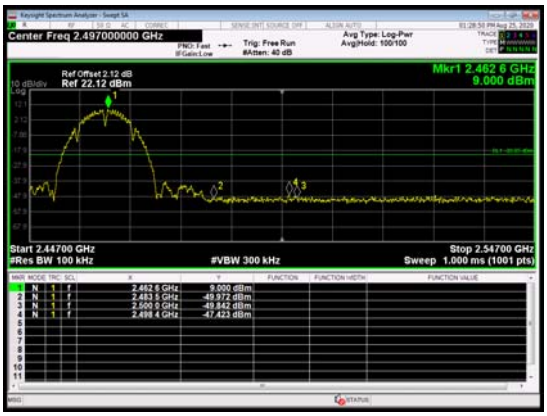
MIMO Antenna

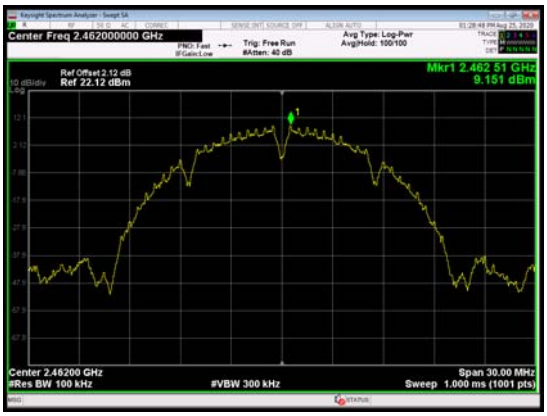
802.11b, Channel No.: 1



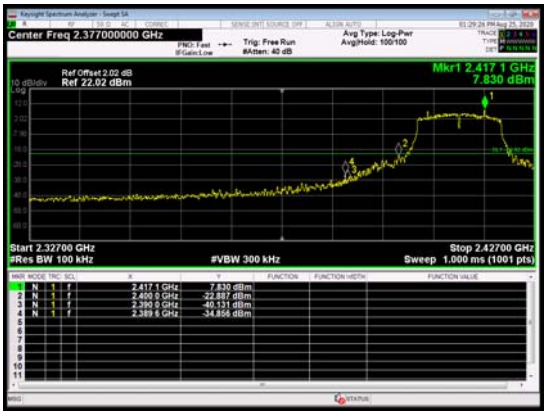


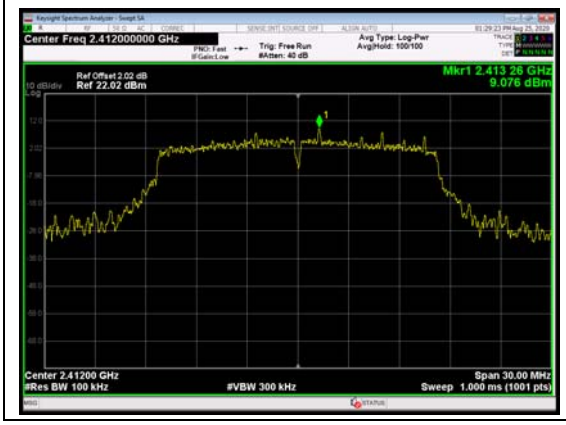
802.11b, Channel No.: 11



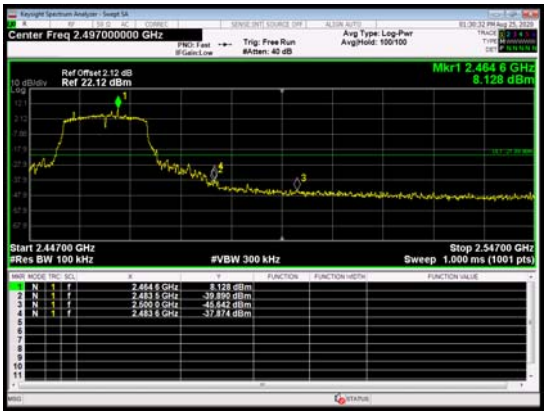


802.11g, Channel No.: 1





802.11g, Channel No.: 11



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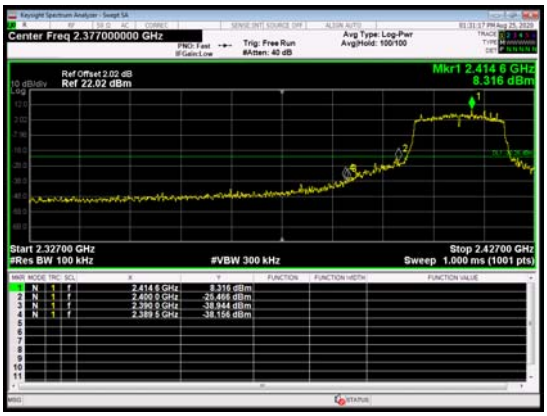
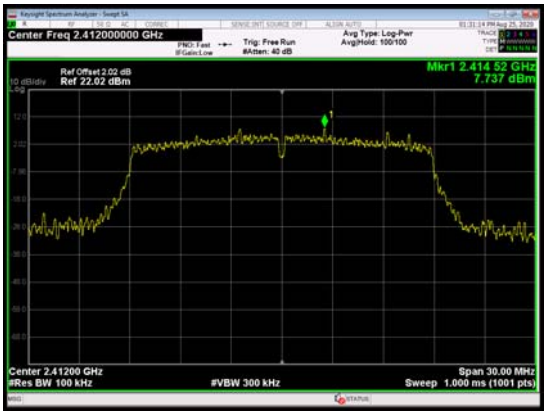
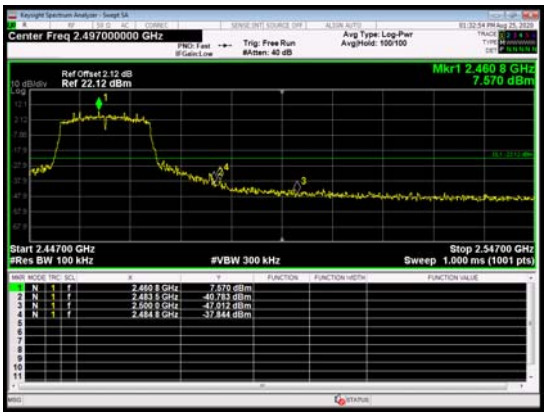
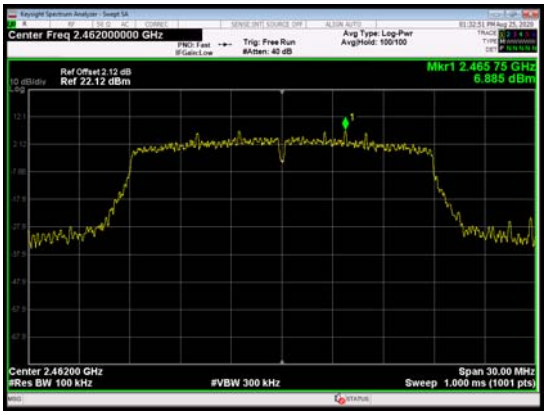
802.11n(HT20), Channel No.: 1



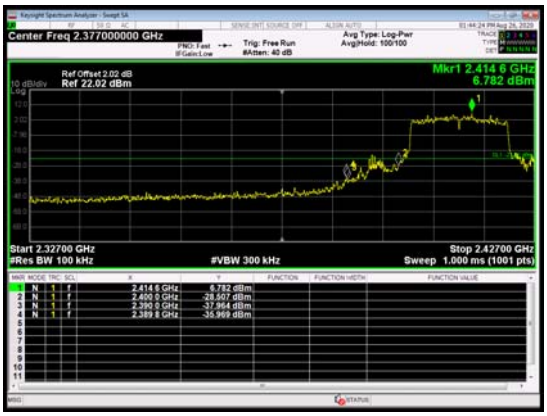


802.11n(HT20), Channel No.: 11

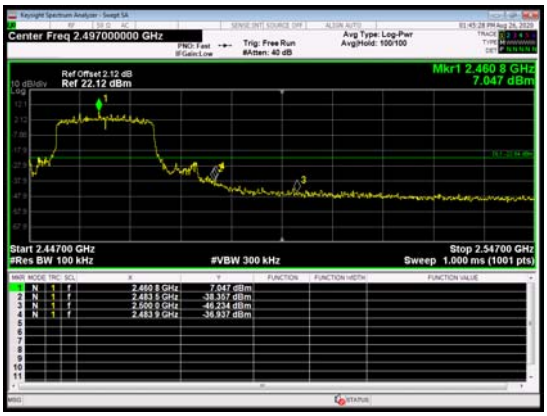


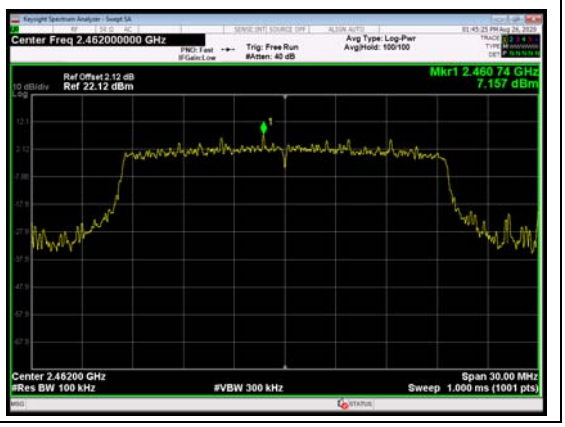


802.11ax(HE20), Channel No.: 1



802.11ax(HE20), Channel No.: 11





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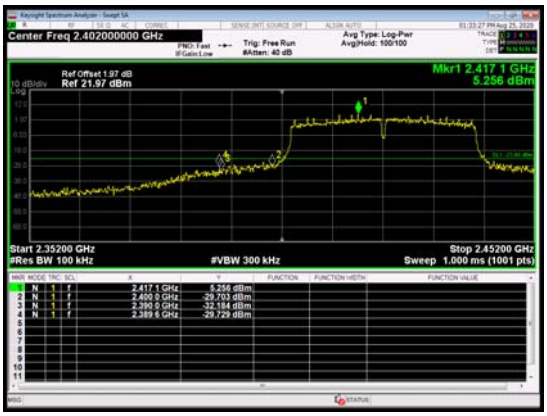
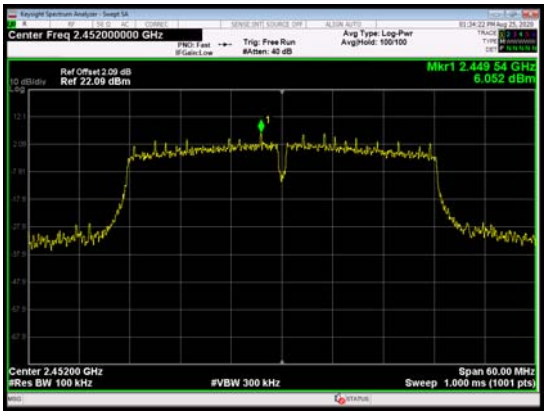
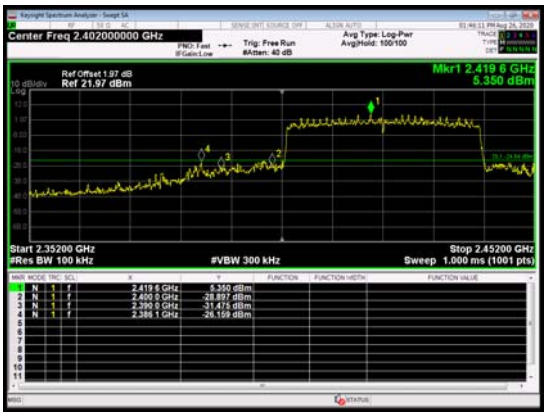
802.11n(HT40), Channel No.: 3

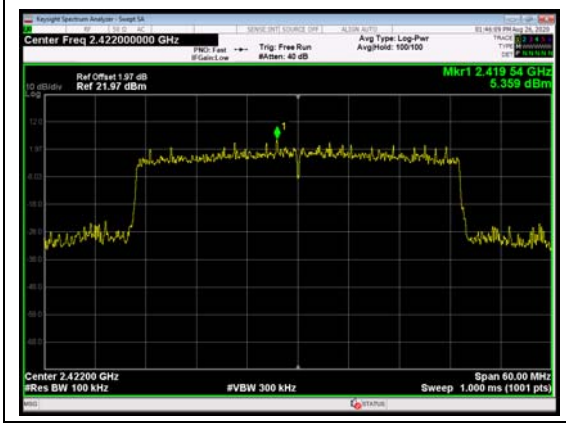


802.11n(HT40), Channel No.: 9

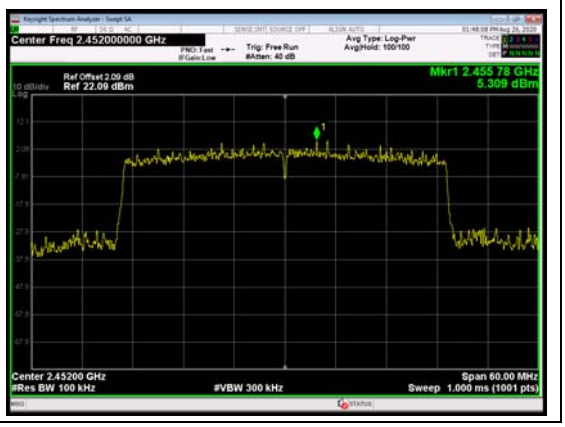


802.11ax(HE40), Channel No.: 3





802.11ax(HE40), Channel No.: 9



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5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation.

Method AVGPSD-1 was used for this test.

a) Set instrument center frequency to DTS channel center frequency

b) Set span to at least 1.5 times the OBW

c) Set RBW to:3kHz≤RBW≤100kHz

d) Set VBW≥[3x RBW]

e) Detector=power averaging(rms) or sample detector(when rms not available)

f) Ensure that the number of measurement points in the sweep 2[2 X span/RBWT]

g)Sweep time auto couple

h) Employ trace averaging(rms) mode over a minimum of 100 traces

i) Use the peak marker function to determine the maximum amplitude level.

j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat(note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

Method AVGPSD-2 was used for this test.

a) Measure the duty cycle(D)of the transmitter output signal as described in 11.6

b) Set instrument center frequency to DTS channel center frequency

c)Set span to at least 1.5 times the OBW

d) Set RBW to:3kHz≤RBW≤100Kh

e) Set VBW≥[3x RBW]

f)Detector= power averaging(rms) or sample detector (when rms not available)

g) Ensure that the number of measurement points in the sweep 2[2 X span/RBW]

h) Sweep time =auto couple

i) Do not use sweep triggering; allow sweep to "free run”

j) Employ trace averaging(rms) mode over a minimum of 100 traces

k) Use the peak marker function to determine the maximum amplitude level

l) Add [10 log(1/ D)], where D is the duty cycle measured in step a), to the measured PSD to

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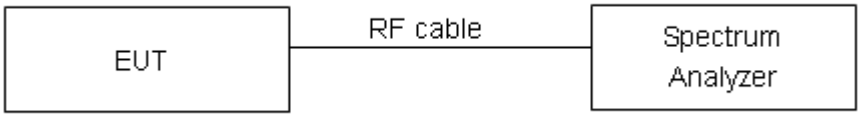
compute the average PSD during the actual transmission time

m) If measured value exceeds requirement specified by regulatory agency then reduce RBW(but o less than 3 kHz) and repeat(note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. ''

Limits	≤ 8 dBm / 3kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 2, *U*= 0.75dB.

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Test Results:

MIMO

Without Beamforming

Network Standards	Channel Number	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11b	1	-11.73	-11.73	-13.24	-13.24	-9.41	7.90	PASS
	6	-10.04	-10.04	-10.58	-10.58	-7.29	7.60	PASS
	11	-12.24	-12.24	-13.05	-13.05	-9.62	7.60	PASS
802.11g	1	-12.70	-12.51	-13.55	-13.36	-9.90	7.90	PASS
	6	-9.95	-9.75	-10.24	-10.05	-6.89	7.60	PASS
	11	-13.16	-12.96	-13.53	-13.34	-10.14	7.60	PASS
802.11n HT20	1	-13.98	-13.76	-15.17	-14.95	-11.31	7.90	PASS
	6	-11.00	-10.79	-10.77	-10.56	-7.66	7.60	PASS
	11	-14.24	-14.03	-15.05	-14.83	-11.40	7.60	PASS
802.11ax HE20	1	14.54	14.77	-15.74	-15.51	14.78	7.90	PASS
	6	-11.31	-11.07	-12.16	-11.93	-8.47	7.60	PASS
	11	-14.87	-14.64	-14.66	-14.42	-11.52	7.60	PASS
802.11n HT40	3	-15.61	-15.24	-17.43	-17.07	-13.05	7.90	PASS
	6	-14.72	-14.36	-15.96	-15.59	-11.92	7.60	PASS
	9	-15.96	-15.59	-15.93	-15.56	-12.57	7.60	PASS
802.11ax HE40	3	-17.94	-17.51	-18.26	-17.83	-14.66	7.90	PASS
	6	-15.11	-14.68	-15.27	-14.84	-11.75	7.60	PASS
	9	-17.63	-17.20	-17.82	-17.39	-14.28	7.60	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. According to KDB 662911 D01 Multiple Transmitter Output v02r01:

for 2400MHz:directional gain=6.1 >6dBi. So the PSD limt is 8+6-MAX(6, directional gain)dBm=7.9 dBm

for 2450MHz: directional gain=6.4 >6dBi. So the PSD limt is 8+6-MAX(6, directional gain)dBm=7.6 dBm

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With Beamforming

Network Standards	Channel Number	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11b	1	-11.76	-11.76	-12.04	-12.04	-8.89	8.00	PASS
	6	-9.65	-9.65	-10.57	-10.57	-7.07	8.00	PASS
	11	-12.98	-12.98	-12.51	-12.51	-9.73	8.00	PASS
802.11g	1	-12.87	-12.68	-13.48	-13.29	-9.96	8.00	PASS
	6	-9.87	-9.67	-9.89	-9.70	-6.67	8.00	PASS
	11	-13.28	-13.08	-13.47	-13.28	-10.17	8.00	PASS
802.11n HT20	1	-13.51	-13.30	-14.67	-14.45	-10.83	8.00	PASS
	6	-10.61	-10.39	-11.35	-11.14	-7.74	8.00	PASS
	11	-14.81	-14.60	-14.97	-14.76	-11.67	8.00	PASS
802.11ax HE20	1	-14.72	-14.48	-16.24	-16.00	-12.17	8.00	PASS
	6	-11.22	-10.98	-11.41	-11.17	-8.07	8.00	PASS
	11	-14.53	-14.30	-15.11	-14.88	-11.57	8.00	PASS
802.11n HT40	3	-16.38	-16.01	-17.18	-16.81	-13.38	8.00	PASS
	6	-14.48	-14.12	-15.48	-15.11	-11.57	8.00	PASS
	9	-16.02	-15.66	-16.69	-16.32	-12.97	8.00	PASS
802.11ax HE40	3	-18.11	-17.68	-18.42	-17.98	-14.82	8.00	PASS
	6	-15.26	-14.83	-15.27	-14.84	-11.82	8.00	PASS
	9	-18.04	-17.60	-17.60	-17.16	-14.37	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. Directional gain <6dBi. So the PSD limt is 8 dBm

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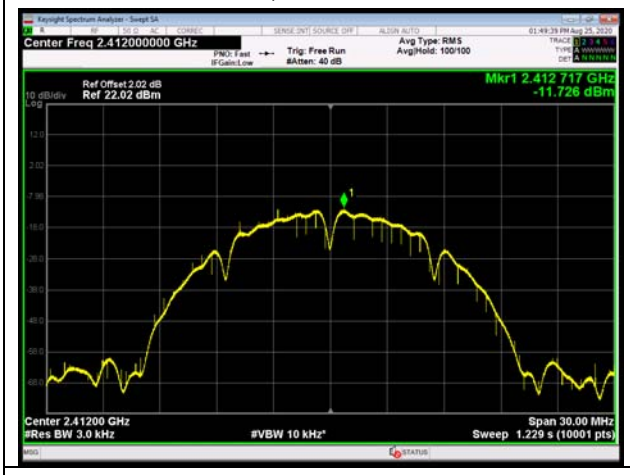
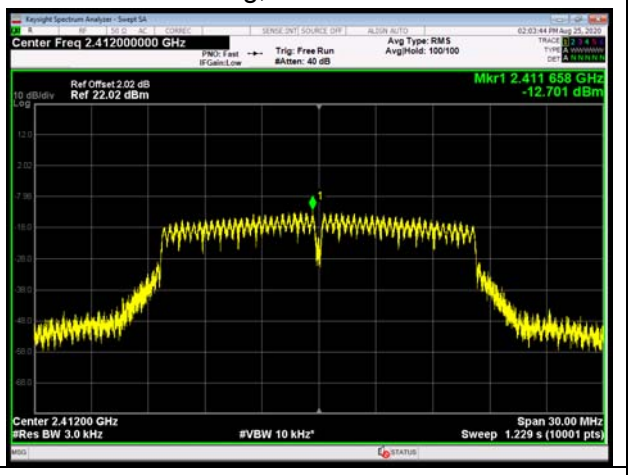
Without Beamforming

MIMO Antenna 1

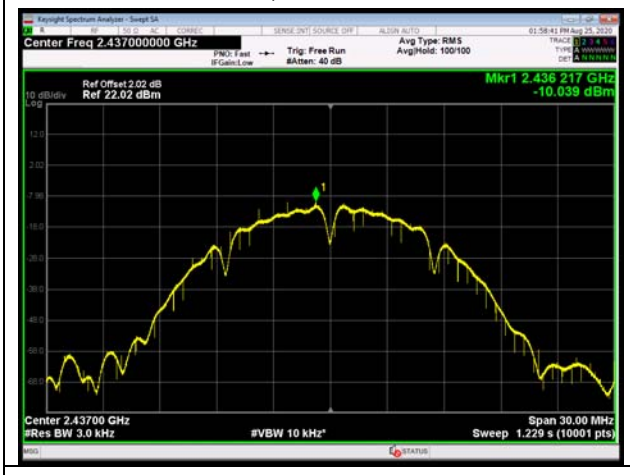
802.11b, Channel No.: 1



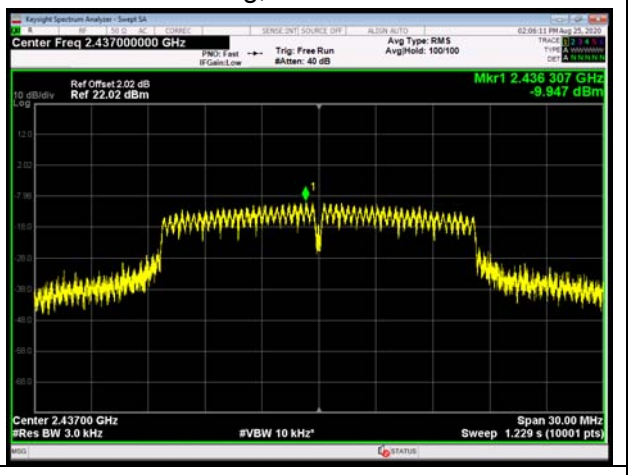
802.11g, Channel No.: 1



802.11b, Channel No.: 6

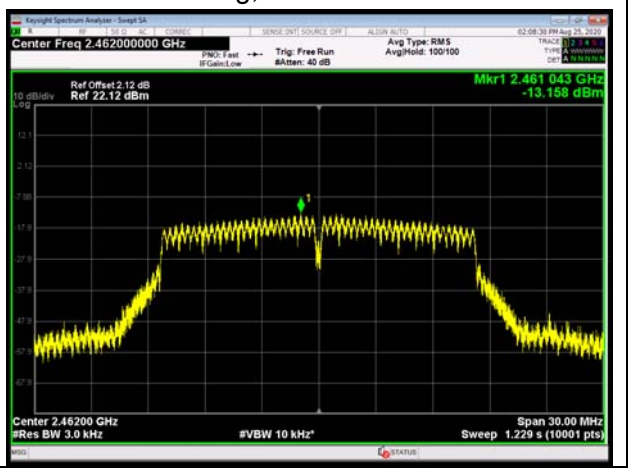


802.11g, Channel No.: 6



802.11b, Channel No.: 11

802.11g, Channel No.: 11



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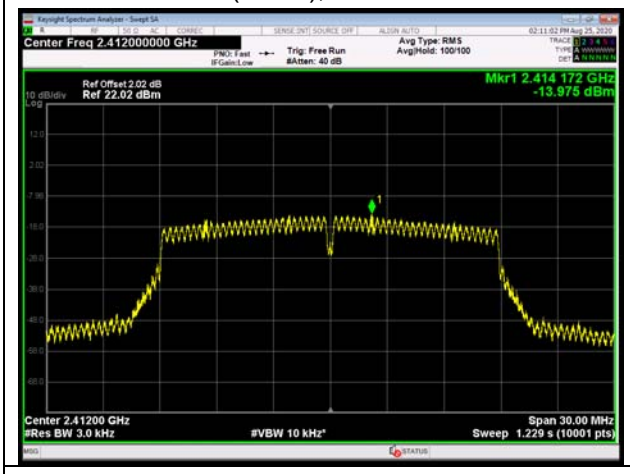
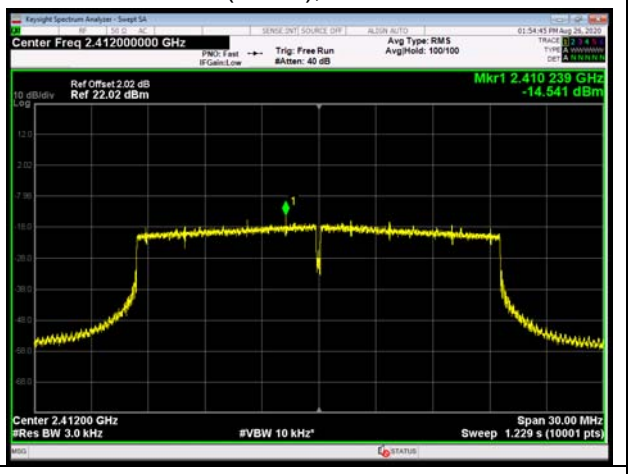
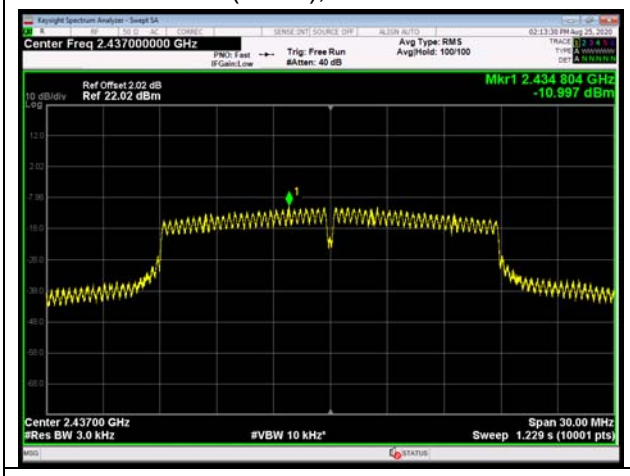
802.11n(HT20), Channel No. 1



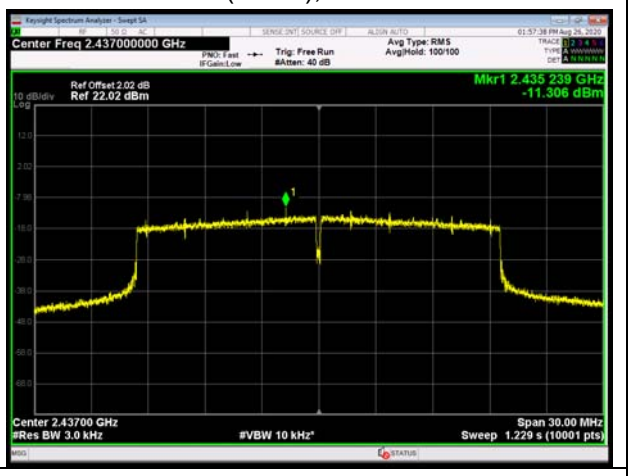
802.11ax(HE20), Channel No. 1



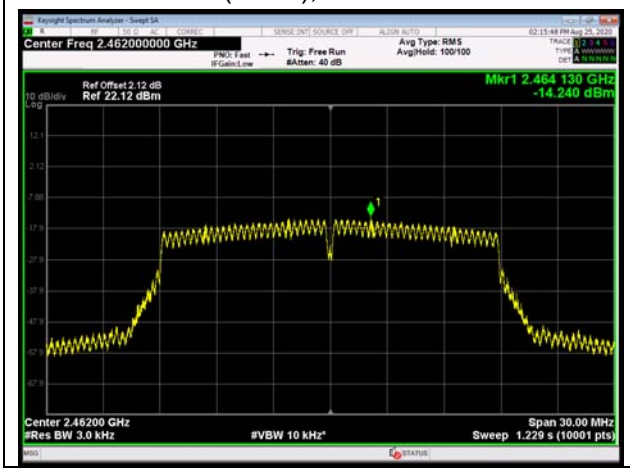
802.11n(HT20), Channel No. 6



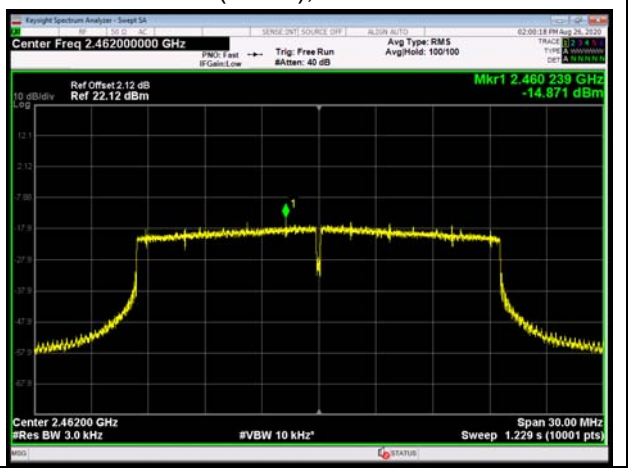
802.11ax(HE20), Channel No. 6



802.11n(HT20), Channel No. 11



802.11ax(HE20), Channel No. 11



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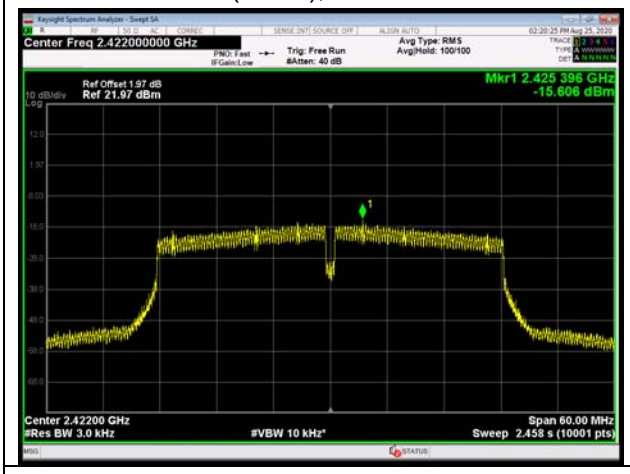
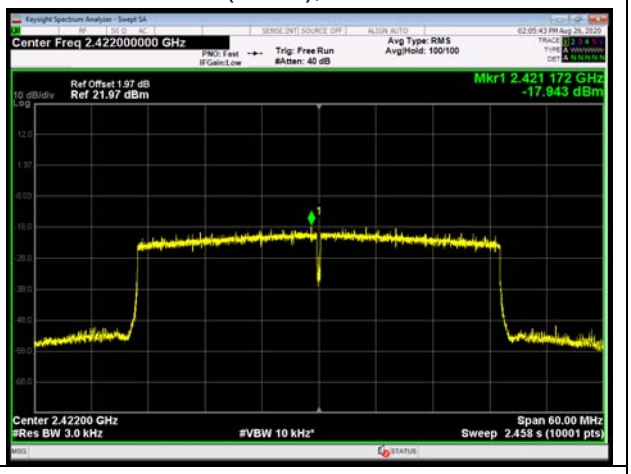
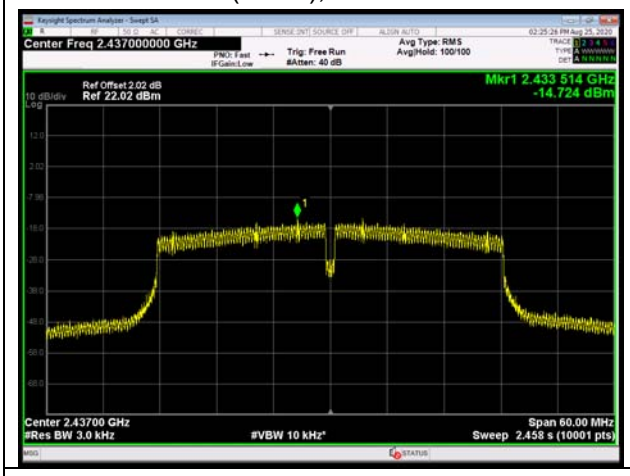
802.11n(HT40), Channel No. 3



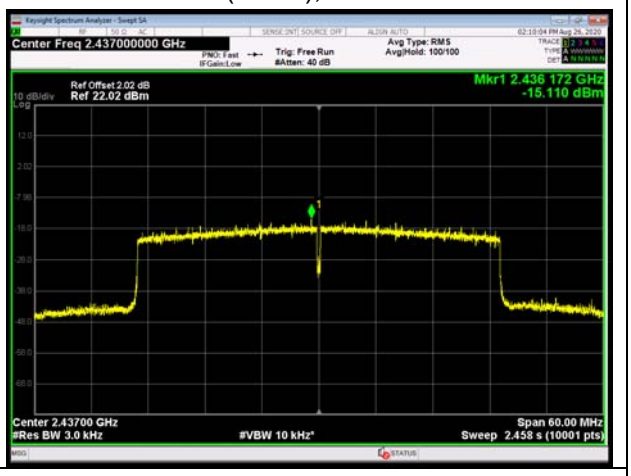
802.11ax(HE40), Channel No. 3



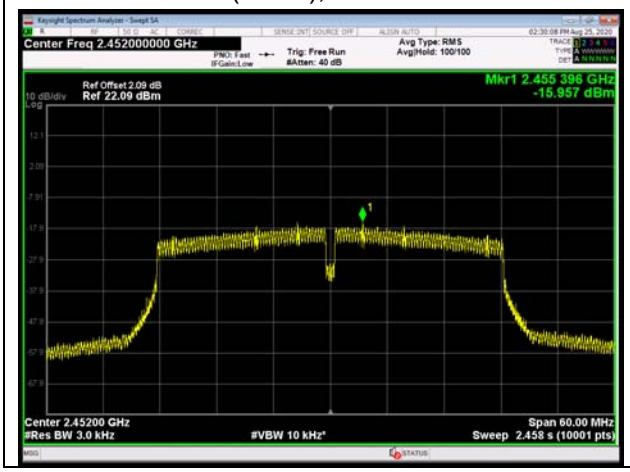
802.11n(HT40), Channel No. 6



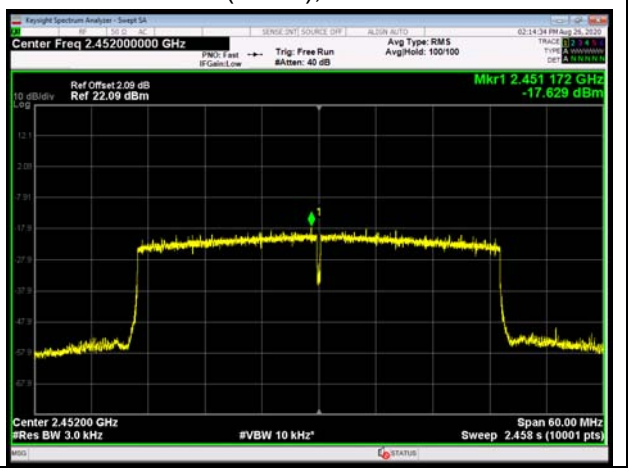
802.11ax(HE40), Channel No. 6



802.11n(HT40), Channel No. 9



802.11ax(HE40), Channel No. 9



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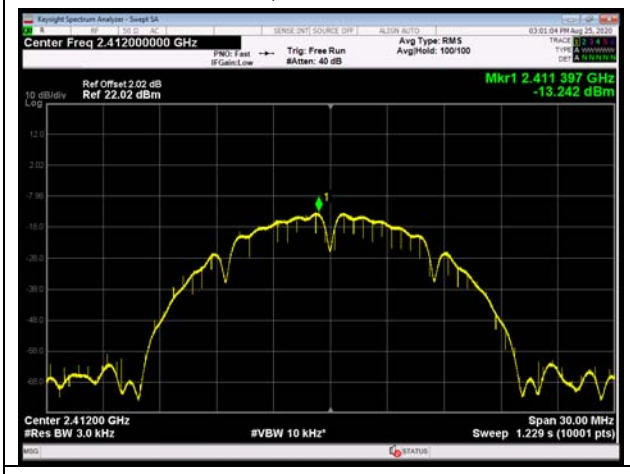
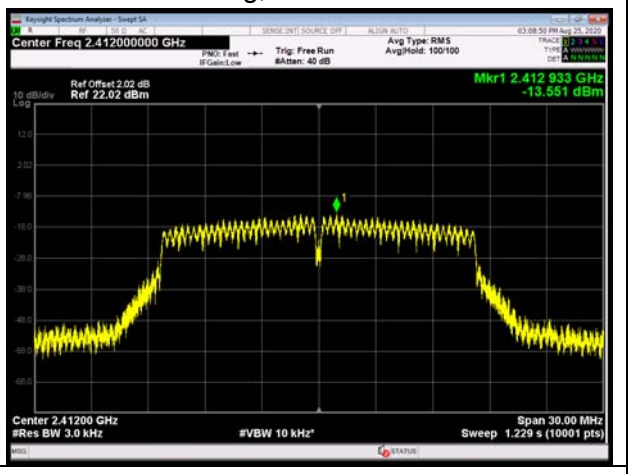
MIMO Antenna 2

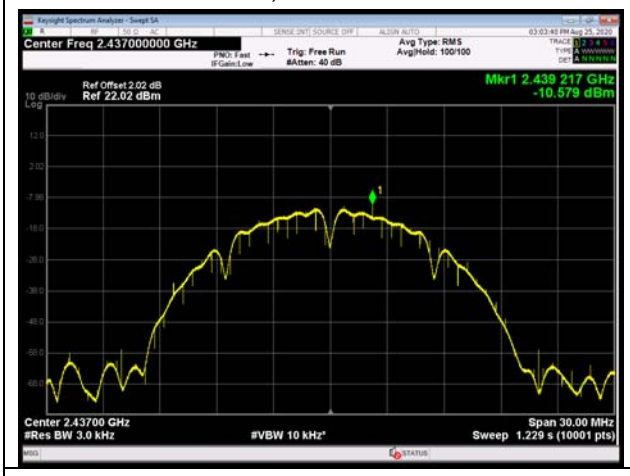
802.11b, Channel No.: 1



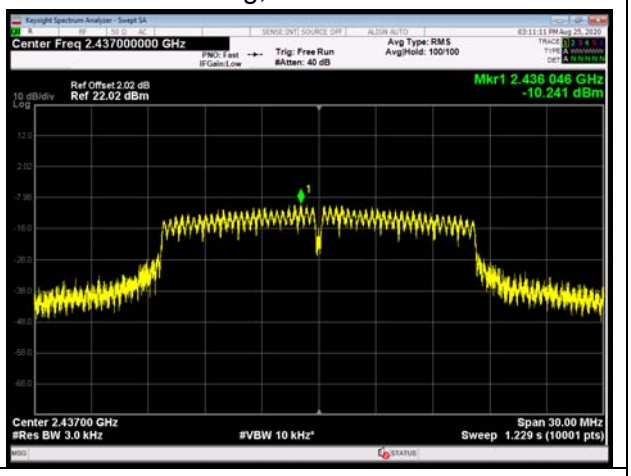
802.11g, Channel No.: 1



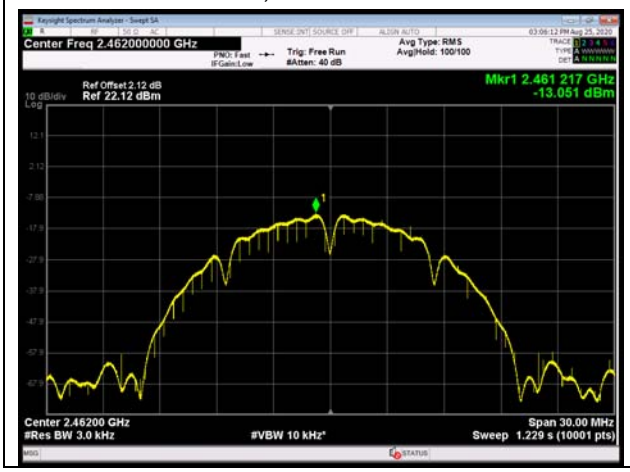
802.11b, Channel No.: 6



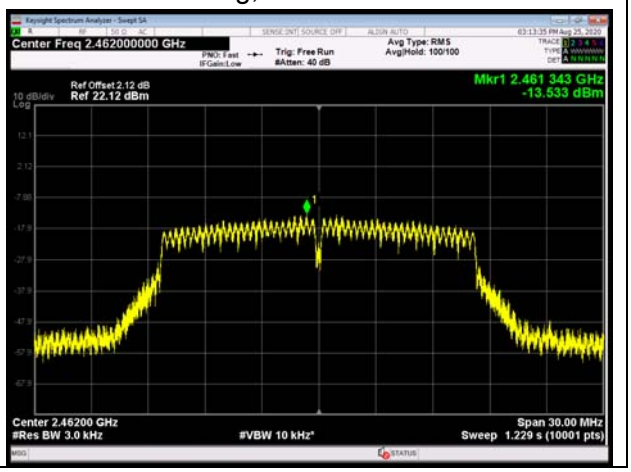
802.11g, Channel No.: 6



802.11b, Channel No.: 11



802.11g, Channel No.: 11



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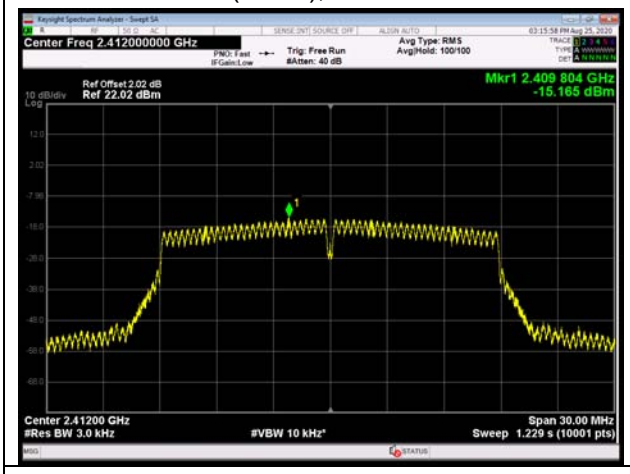
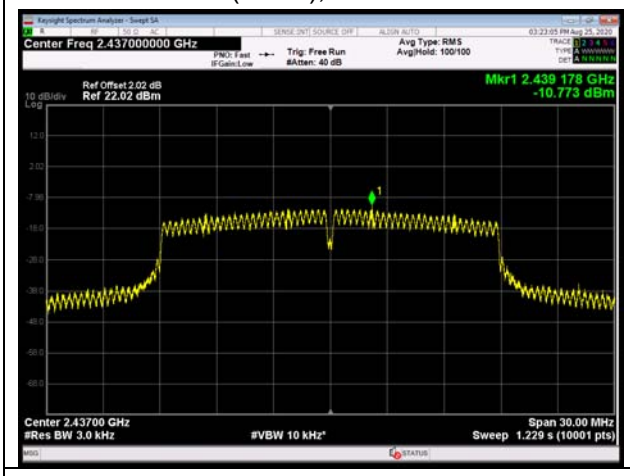
802.11n(HT20), Channel No. 1

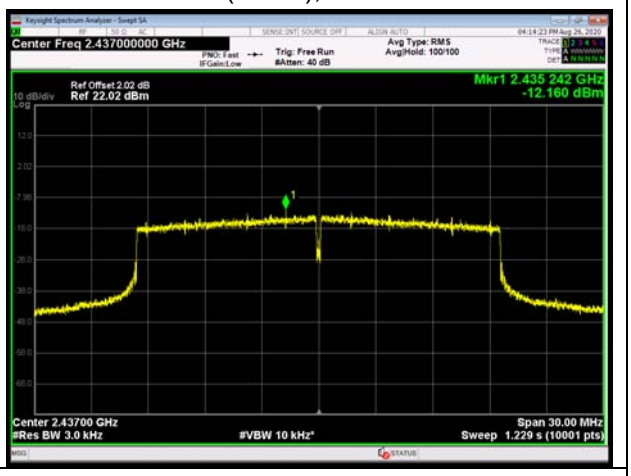


802.11ax(HE20), Channel No. 1

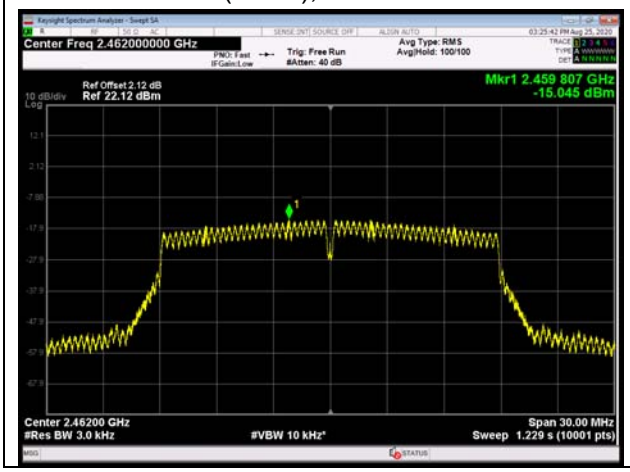
802.11n(HT20), Channel No. 6



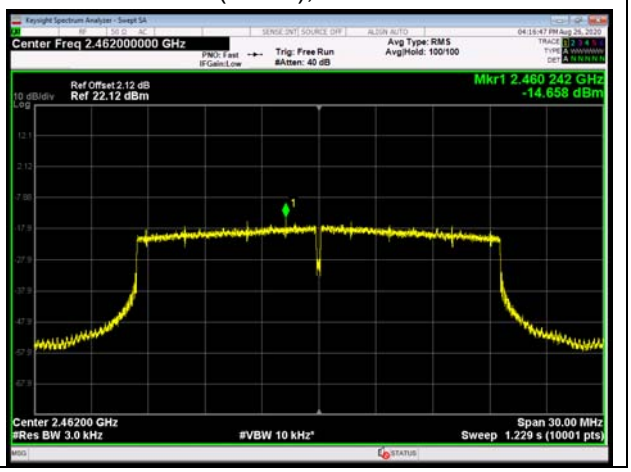
802.11ax(HE20), Channel No. 6



802.11n(HT20), Channel No. 11



802.11ax(HE20), Channel No. 11



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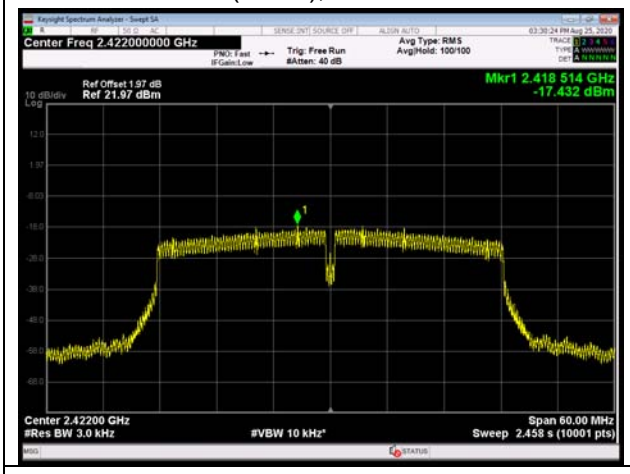
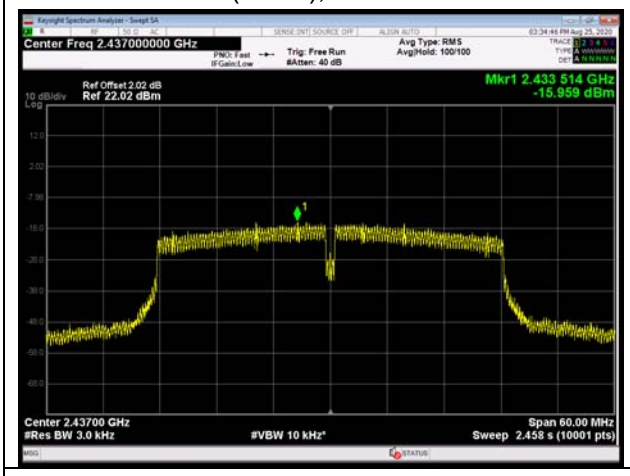
802.11n(HT40), Channel No. 3



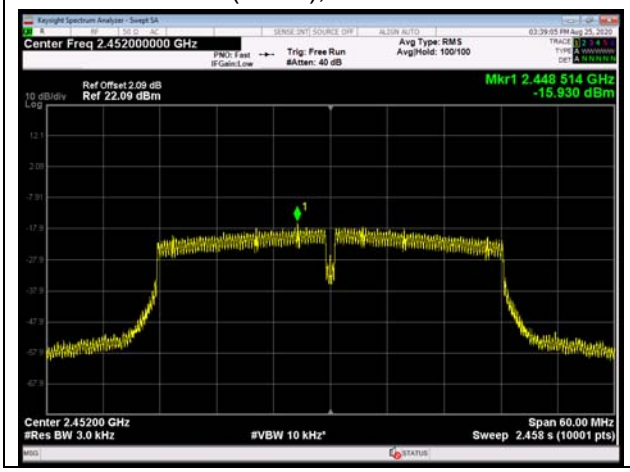
802.11ax(HE40), Channel No. 3

802.11n(HT40), Channel No. 6



802.11ax(HE40), Channel No. 6

802.11n(HT40), Channel No. 9



802.11ax(HE40), Channel No. 9

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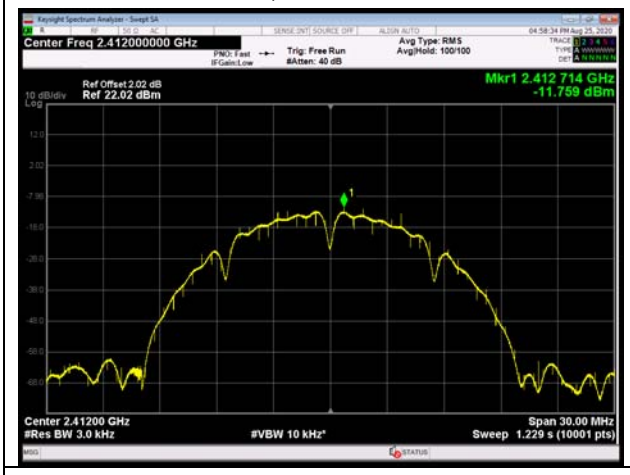
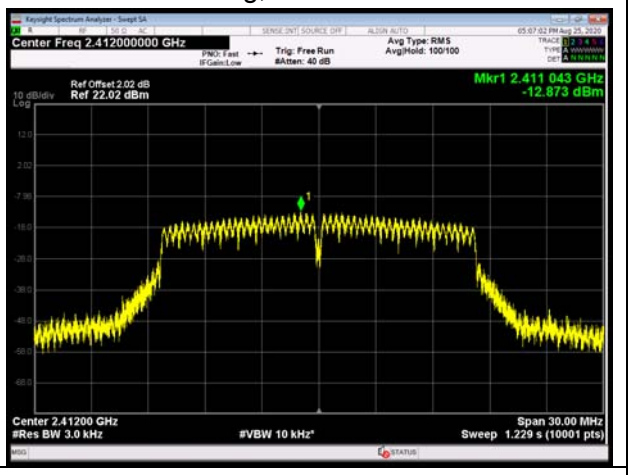
With Beamforming

MIMO Antenna 1

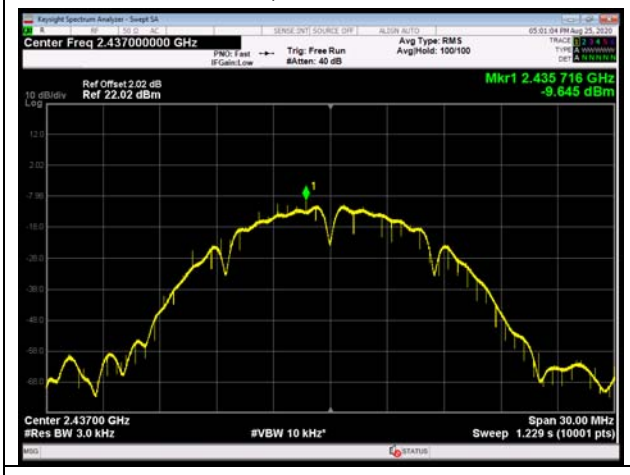
802.11b, Channel No.: 1



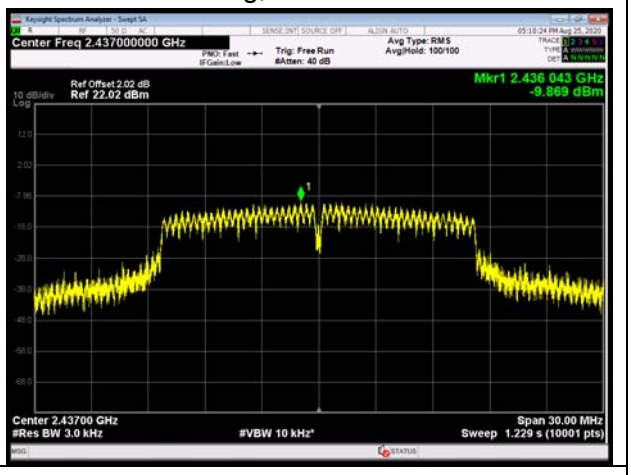
802.11g, Channel No.: 1



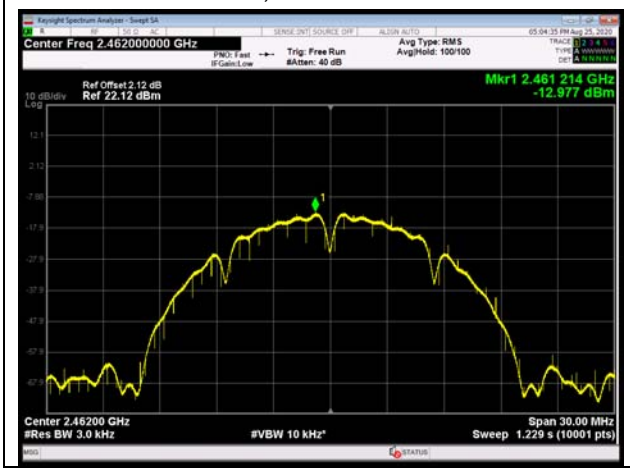
802.11b, Channel No.: 6



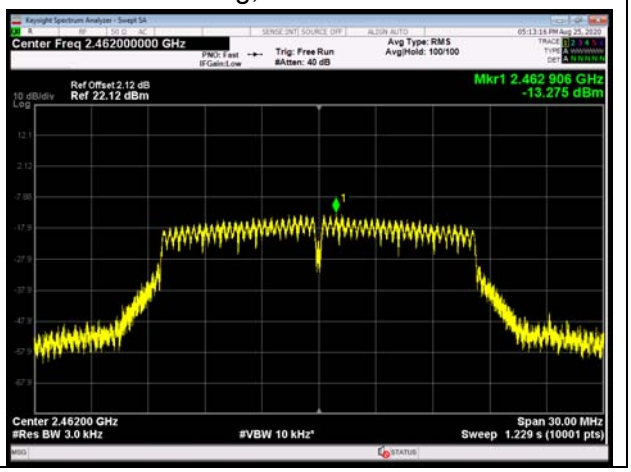
802.11g, Channel No.: 6



802.11b, Channel No.: 11



802.11g, Channel No.: 11



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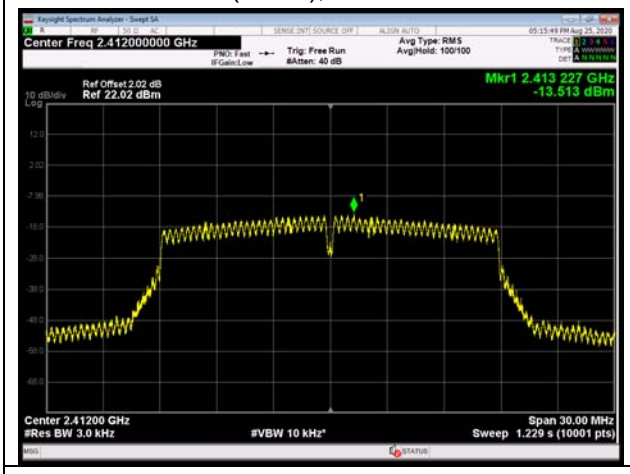
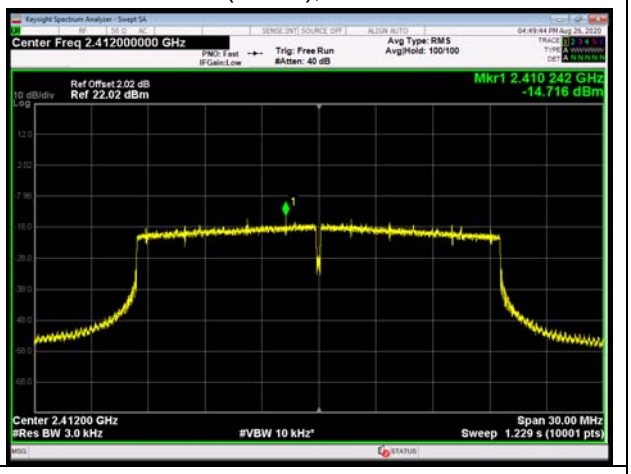
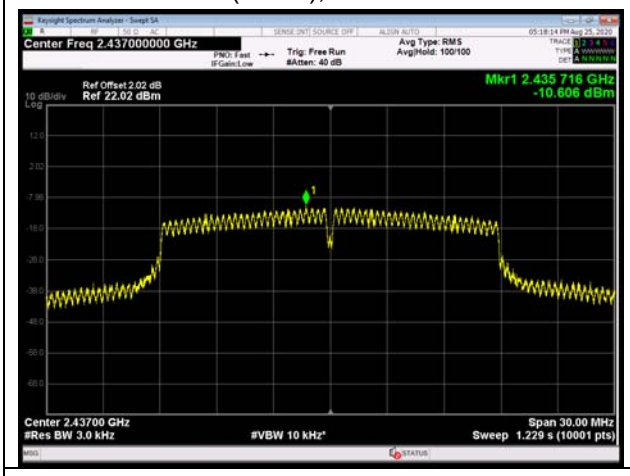
802.11n(HT20), Channel No. 1



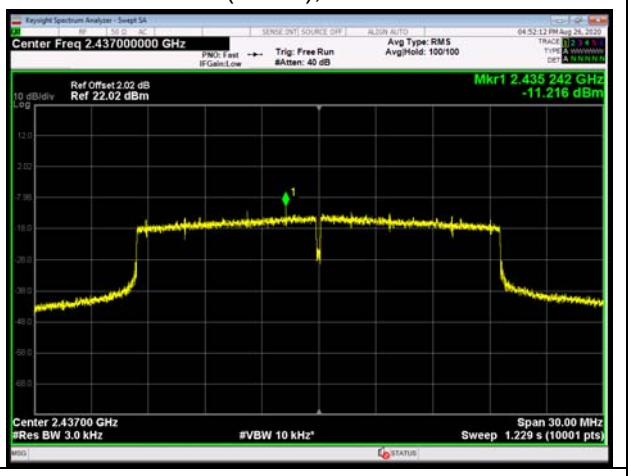
802.11ax(HE20), Channel No. 1



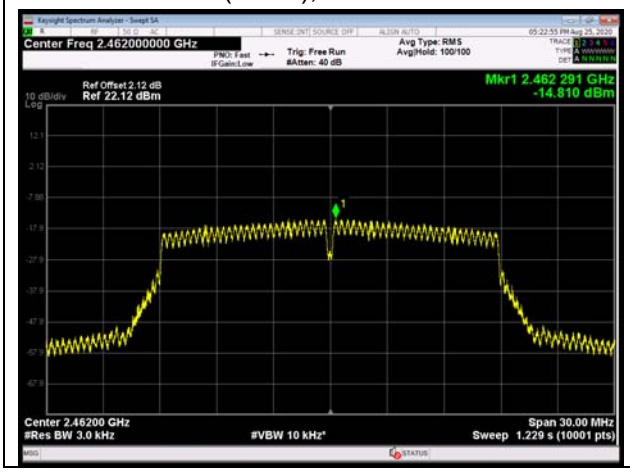
802.11n(HT20), Channel No. 6



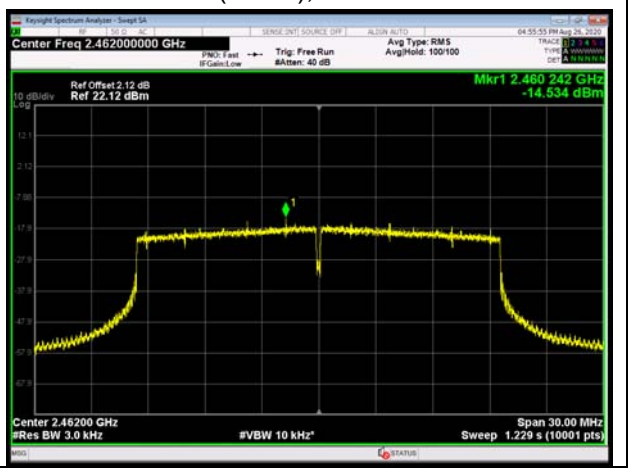
802.11ax(HE20), Channel No. 6



802.11n(HT20), Channel No. 11



802.11ax(HE20), Channel No. 11



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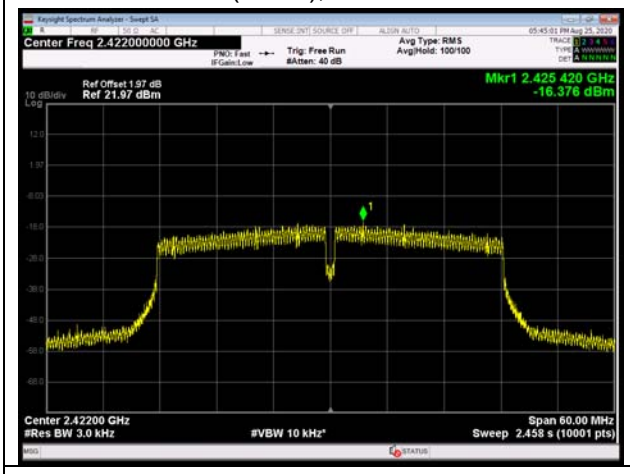
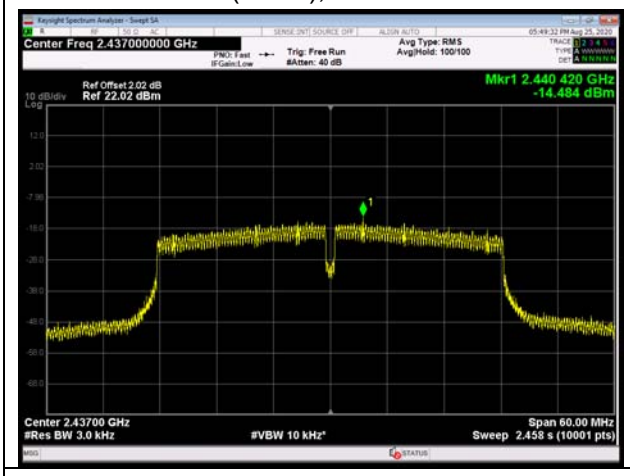
802.11n(HT40), Channel No. 3

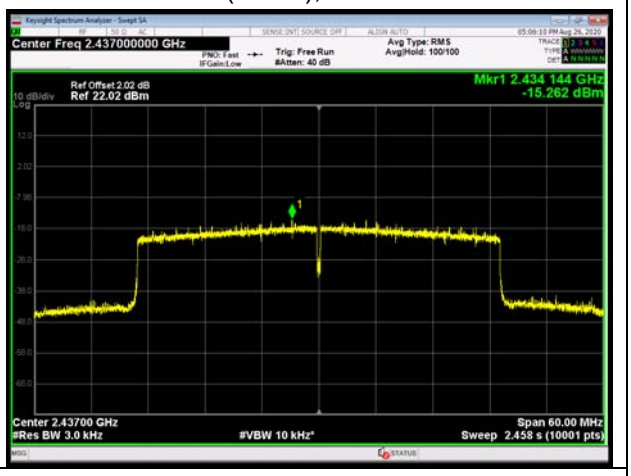


802.11ax(HE40), Channel No. 3

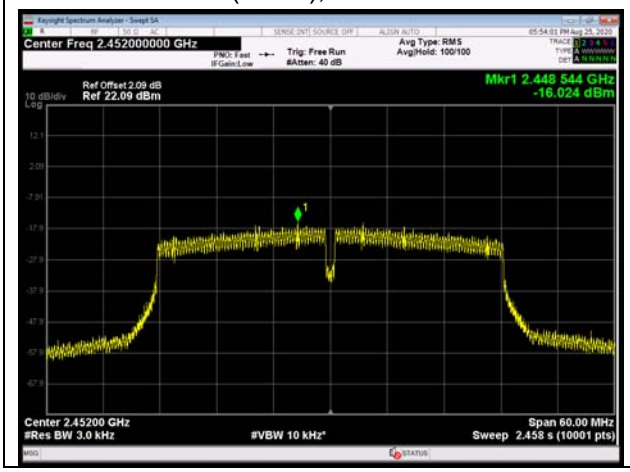
802.11n(HT40), Channel No. 6



802.11ax(HE40), Channel No. 6



802.11n(HT40), Channel No. 9



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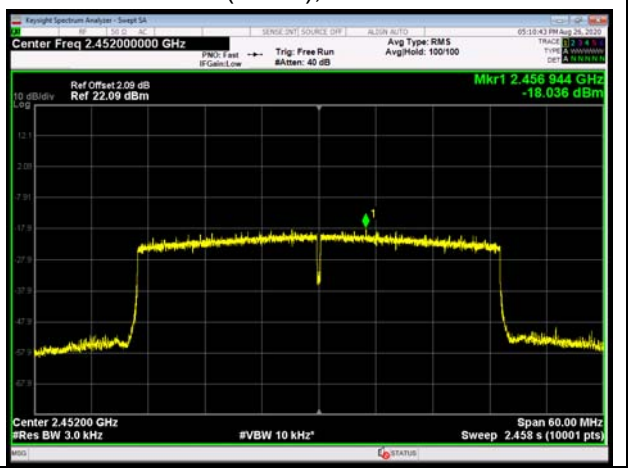

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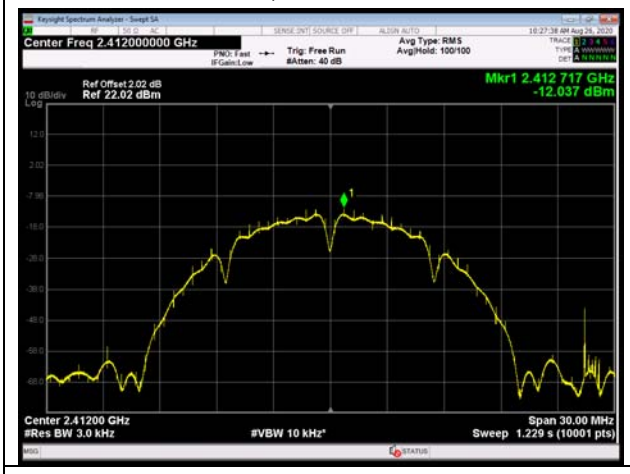
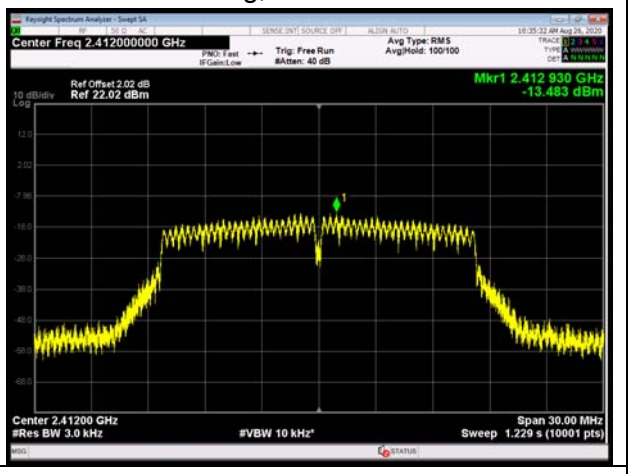
MIMO Antenna 2

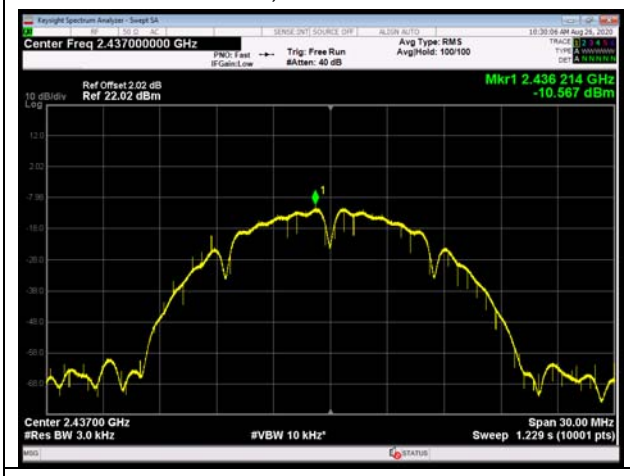
802.11b, Channel No.: 1



802.11g, Channel No.: 1



802.11b, Channel No.: 6



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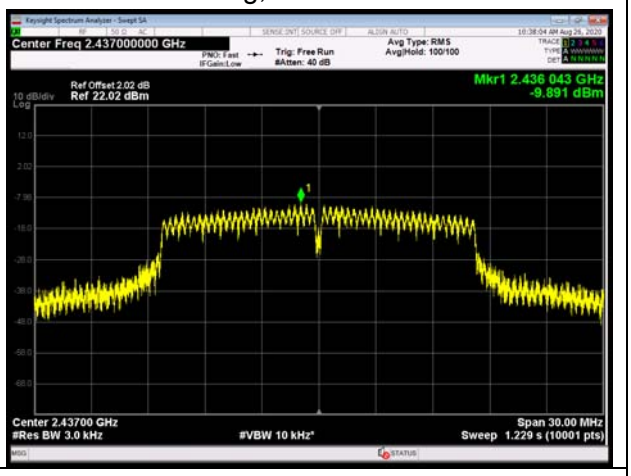
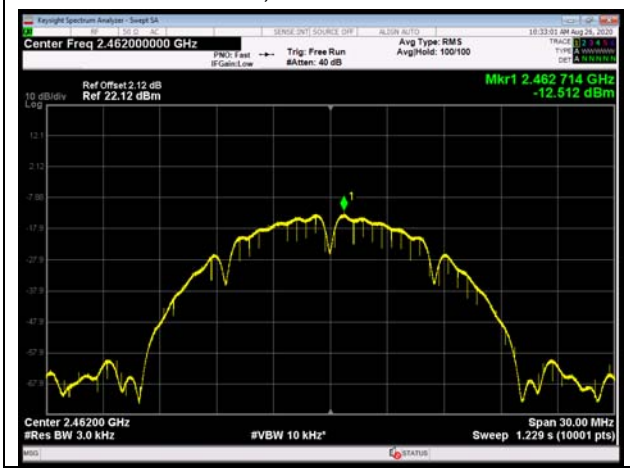


802.11b, Channel No.: 11



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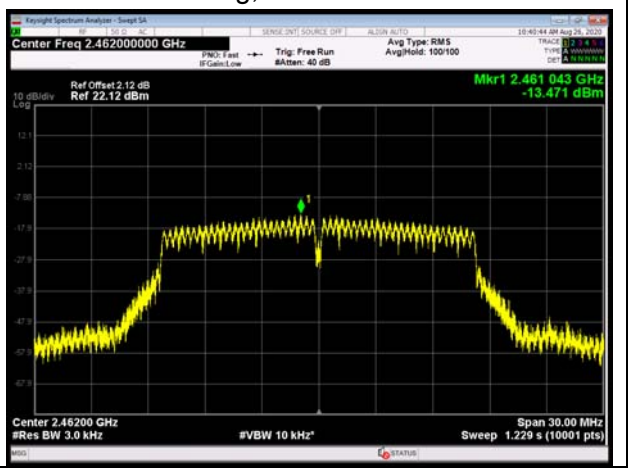

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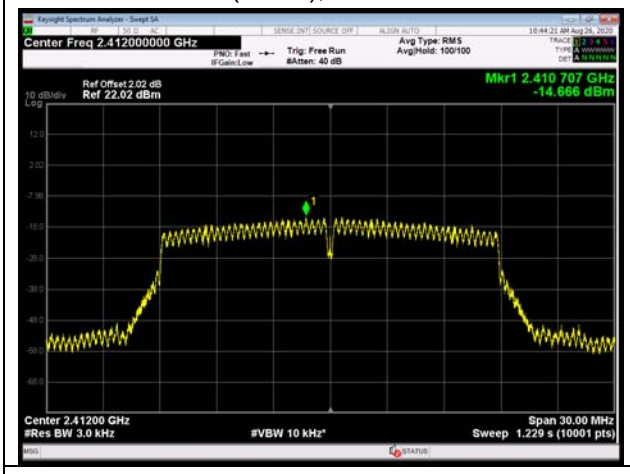
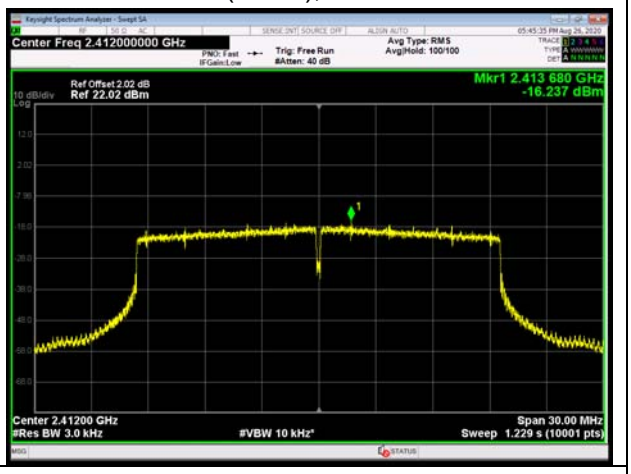
802.11n(HT20), Channel No. 1



802.11ax(HE20), Channel No. 1



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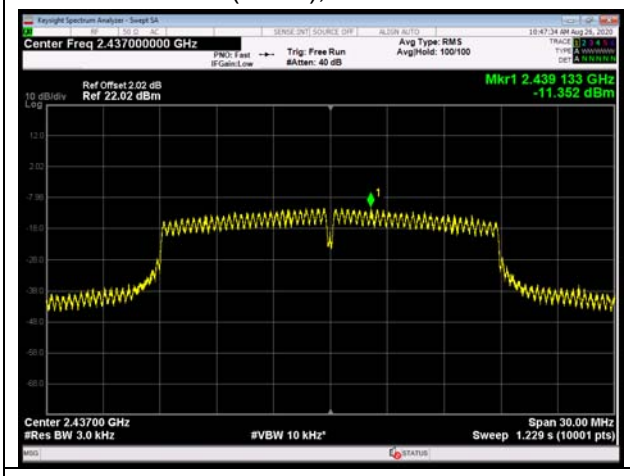

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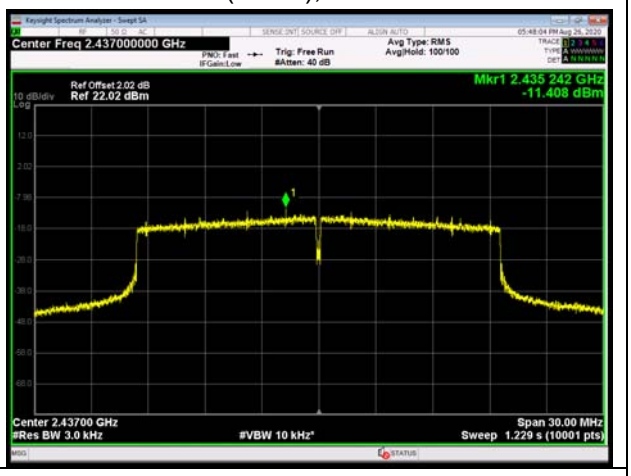

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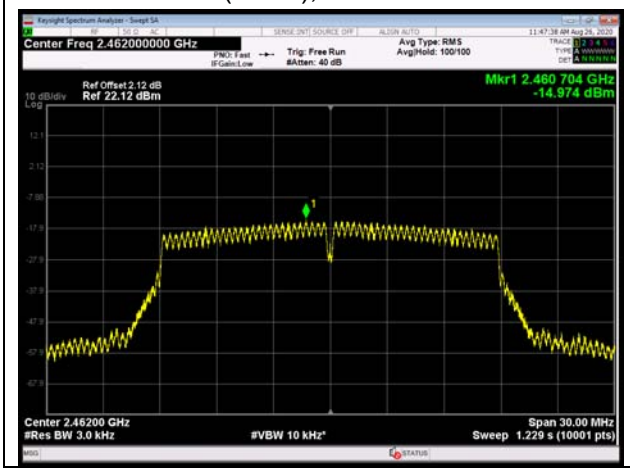

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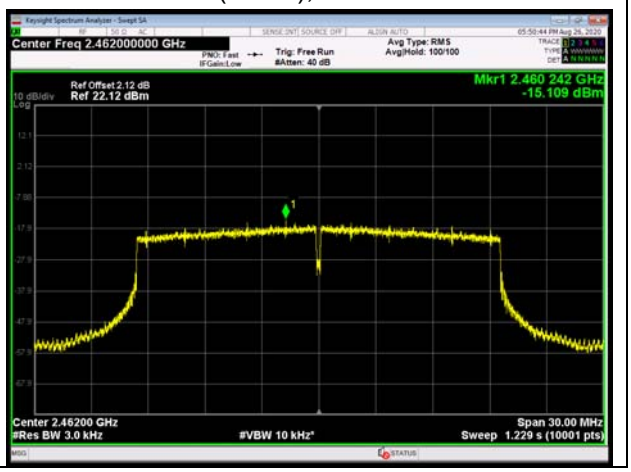

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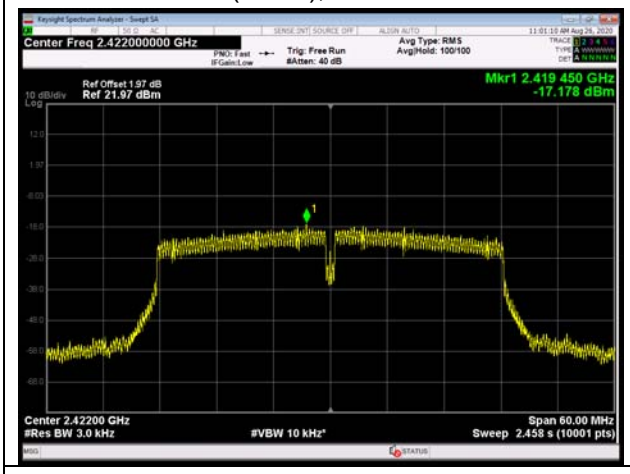
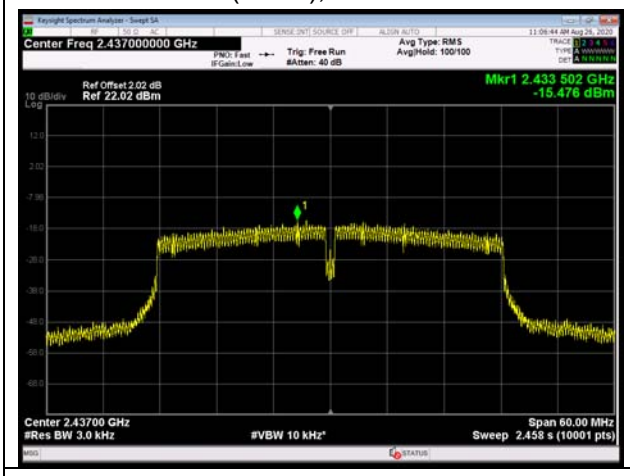
802.11n(HT40), Channel No. 3



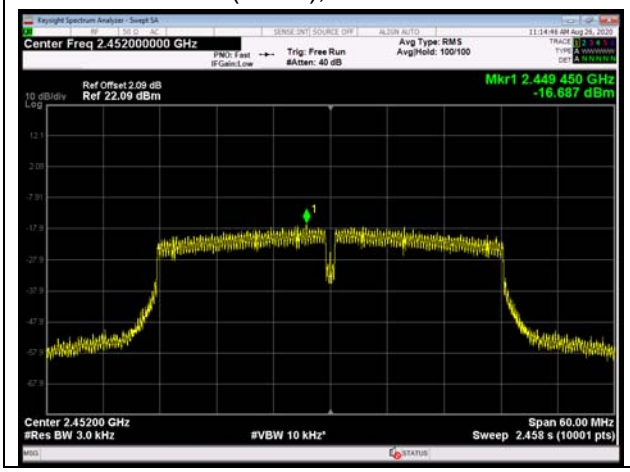
802.11ax(HE40), Channel No. 3

802.11n(HT40), Channel No. 6



802.11ax(HE40), Channel No. 6

802.11n(HT40), Channel No. 9



802.11ax(HE40), Channel No. 9

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5.5. Spurious RF Conducted Emissions

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100 kHz and VBW to 300 kHz, Sweep is set to ATUO.
The test is in transmitting mode.

Test setup

Limits
Rule Part 15.247(d) pacifies that "In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. "

MIMO Antenna

Network Standards	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	9.92	-20.08
	2437	12.00	-18.00
	2462	9.85	-20.15
802.11g	2412	8.83	-21.17
	2437	13.06	-16.94
	2462	8.18	-21.82
802.11n HT20	2412	8.52	-21.48
	2437	12.32	-17.68
	2462	8.43	-21.57
802.11ax HE20	2412	7.92	-22.08
	2437	11.39	-18.61

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	2462	8.34	-21.66
802.11n HT40	2422	6.37	-23.63
	2437	8.56	-21.44
	2452	6.83	-23.17
802.11ax HE40	2422	5.61	-24.39
	2437	9.42	-20.58
	2452	5.64	-24.36

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

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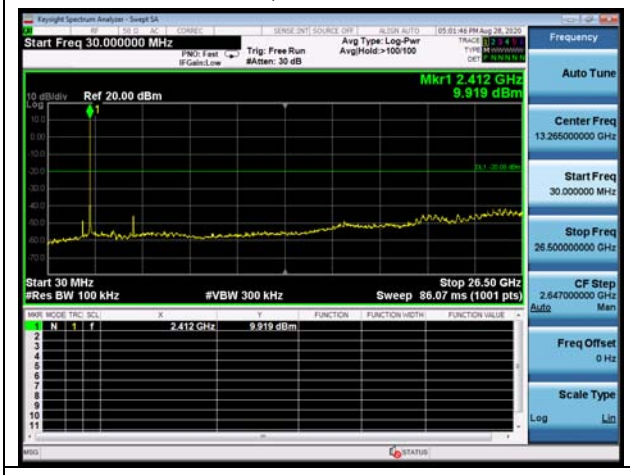
Test Results:

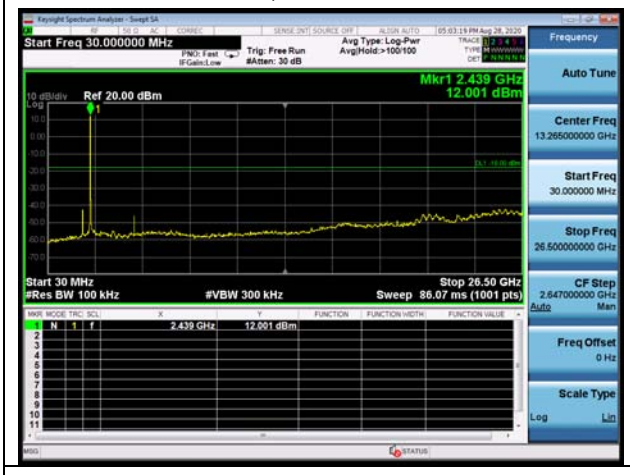
MIMO Antenna

802.11b, Channel No.: 1



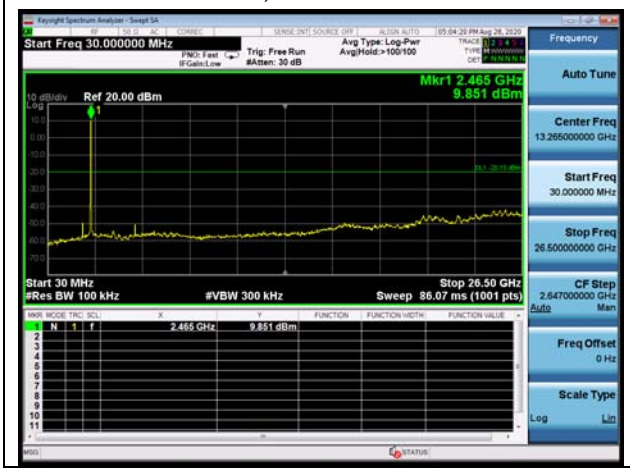
802.11g, Channel No.: 1

802.11b, Channel No.: 6



802.11g, Channel No.: 6

802.11b, Channel No.: 11



802.11g, Channel No.: 11

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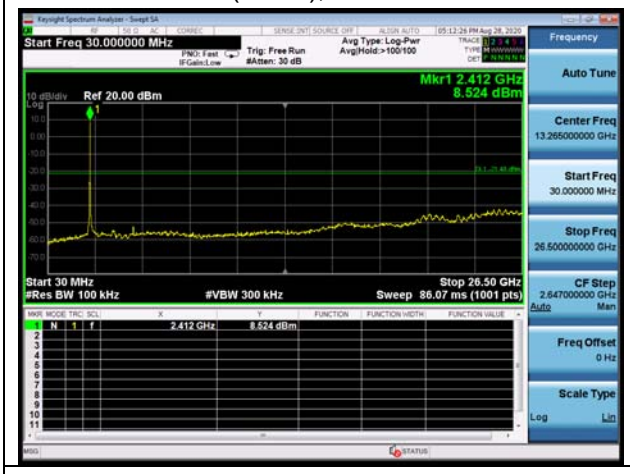
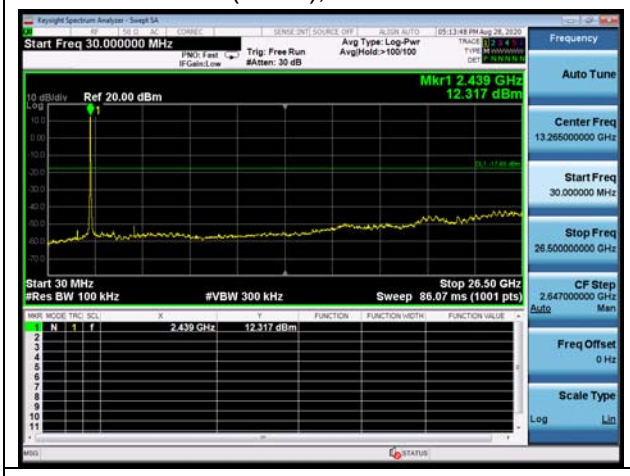
802.11n(HT20), Channel No. 1



802.11ax(HE20), Channel No. 1

802.11n(HT20), Channel No. 6



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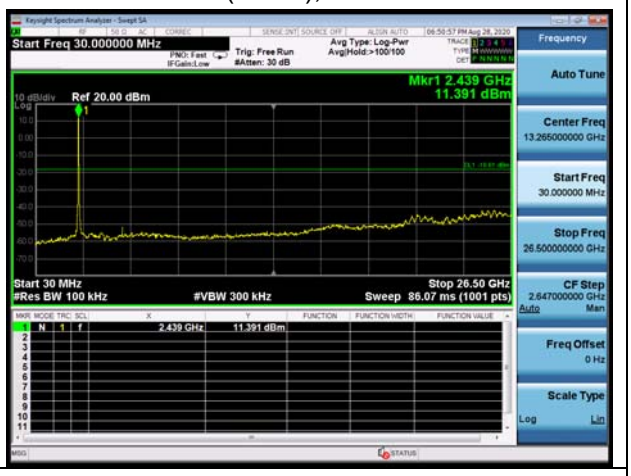

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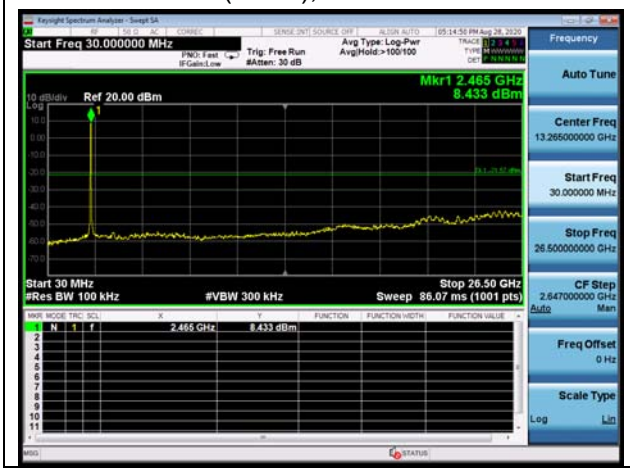

802.11ax(HE20), Channel No. 11

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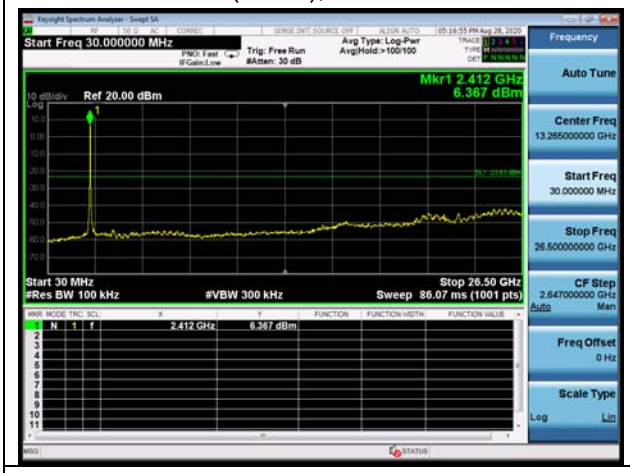
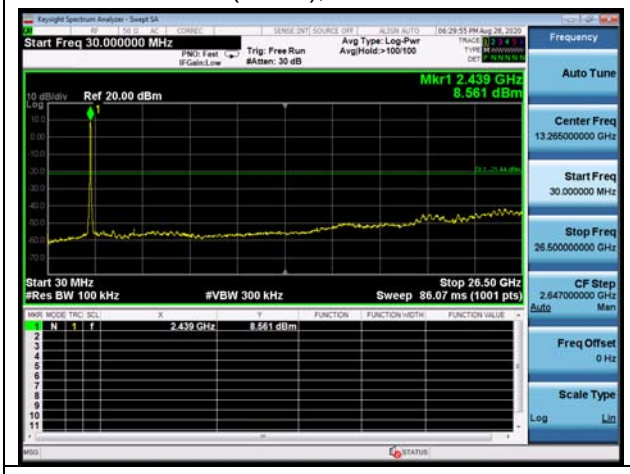
802.11n(HT40), Channel No. 3



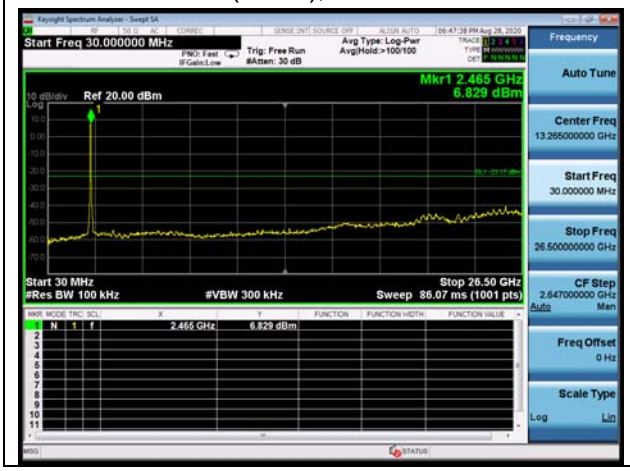
802.11ax(HE40), Channel No. 3

802.11n(HT40), Channel No. 6



802.11ax(HE40), Channel No. 6

802.11n(HT40), Channel No. 9



802.11ax(HE40), Channel No. 9

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5.6. Unwanted Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013.
The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. Sweep the Restricted Band and the emissions less than 20 dB below the permissible value are reported.
The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

This method refer to ANSI C63.10-2013.
The procedure for peak unwanted emissions measurements above 1000 MHz is as follows:
Set the spectrum analyzer in the following:
9kHz~150 kHz
RBW=200Hz, VBW=1kHz/ Sweep=AUTO
150 kHz~30MHz
RBW=9KHz, VBW=30KHz,/ Sweep=AUTO
Below 1GHz
RBW=100kHz / VBW=300kHz / Sweep=AUTO
a) Peak emission levels are measured by setting the instrument as follows:
Above 1GHz
PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
b) Average emission levels are measured by setting the instrument as follows:
Above 1GHz
AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO
c) Detector: The measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage

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averaging. Log or dB averaging shall not be used.)

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

The test is in transmitting mode.

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