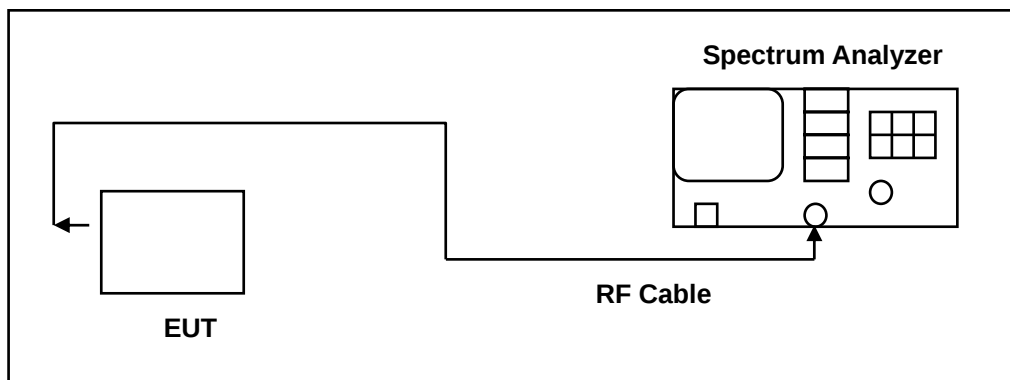


9 Out of Band Conducted Emissions Measurement

■ Limit

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 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

■ Test Setup



■ Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Spectrum Analyzer	Agilent	E4408B	MY45107753	08/08/2016	1 year
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/23/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ Test Procedure

In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 30 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band.

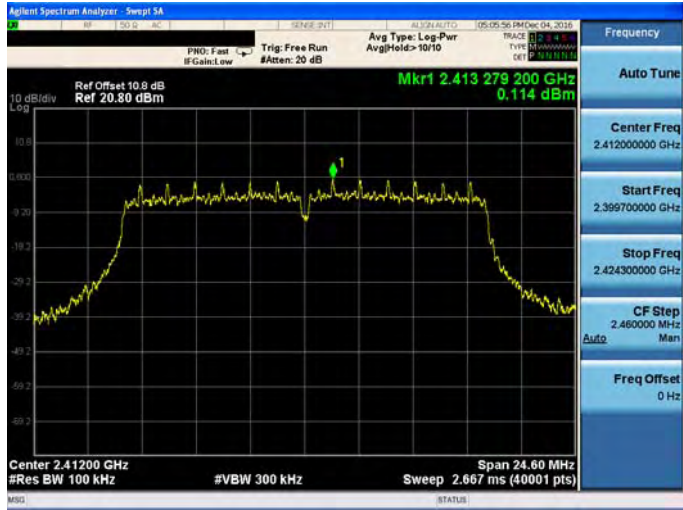
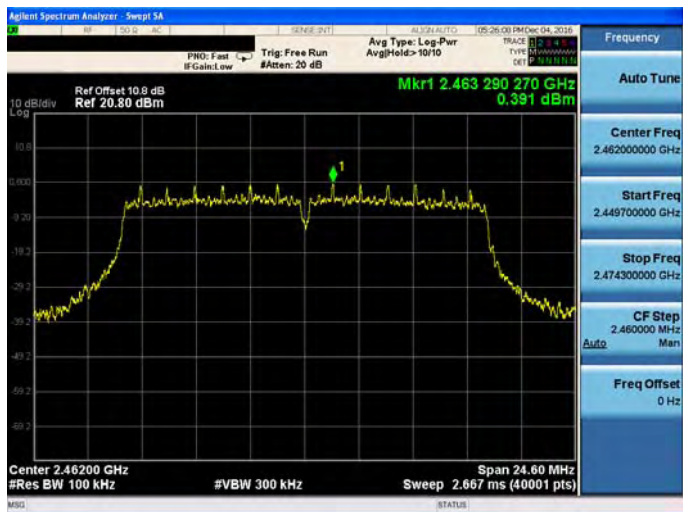
The test was performed at 3 channels.

■ Test Graphs

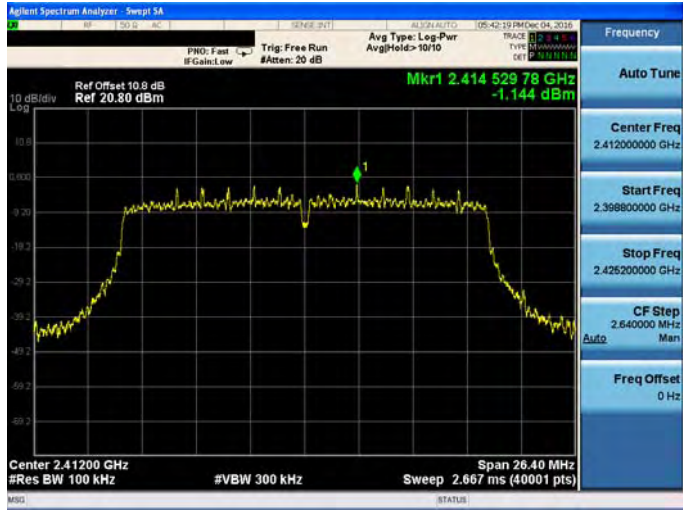
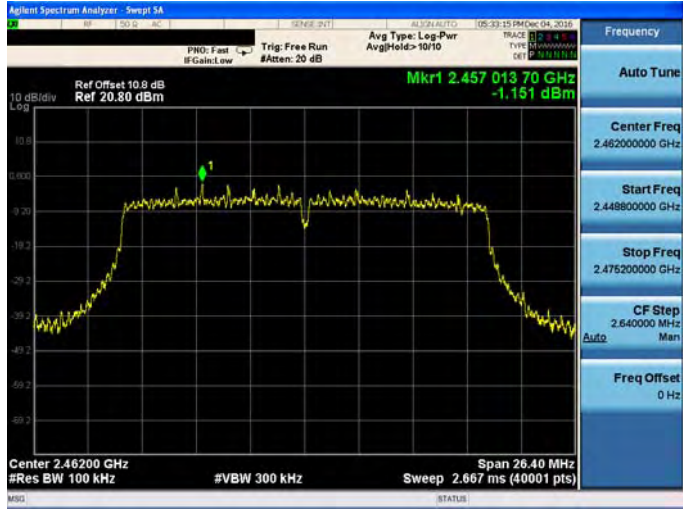
Reference level

Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-0
2412 MHz	 Apptem Spectrum Analyzer - Sweep 3A Ref Offset 10.0 dB Ref 20.80 dBm Mkr1 2.41301802 GHz 8.214 dBm Center 2.412000 GHz #Res BW 100 kHz #VBW 300 kHz Span 15.20 MHz Sweep 2.667 ms (40001 pts) Frequency Auto Tune Center Freq 2.412000000 GHz Start Freq 2.404400000 GHz Stop Freq 2.419600000 GHz CF Step 1.520000 MHz Auto Freq Offset 0 Hz
2437 MHz	 Apptem Spectrum Analyzer - Sweep 3A Ref Offset 10.0 dB Ref 20.80 dBm Mkr1 2.43602302 GHz 8.170 dBm Center 2.437000 GHz #Res BW 100 kHz #VBW 300 kHz Span 15.20 MHz Sweep 2.667 ms (40001 pts) Frequency Auto Tune Center Freq 2.437000000 GHz Start Freq 2.429400000 GHz Stop Freq 2.444600000 GHz CF Step 1.520000 MHz Auto Freq Offset 0 Hz
2462 MHz	 Apptem Spectrum Analyzer - Sweep 3A Ref Offset 10.0 dB Ref 20.80 dBm Mkr1 2.46101846 GHz 7.911 dBm Center 2.462000 GHz #Res BW 100 kHz #VBW 300 kHz Span 15.20 MHz Sweep 2.667 ms (40001 pts) Frequency Auto Tune Center Freq 2.462000000 GHz Start Freq 2.454400000 GHz Stop Freq 2.469600000 GHz CF Step 1.520000 MHz Auto Freq Offset 0 Hz

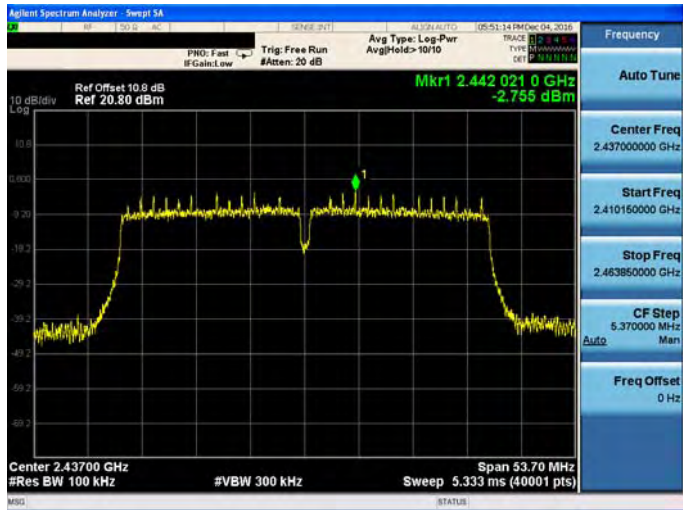
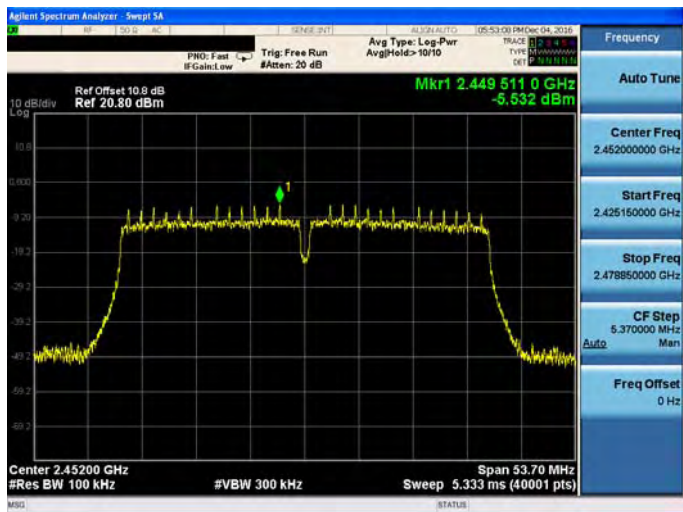


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-0
2412 MHz	
2437 MHz	
2462 MHz	



Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-0
2412 MHz	
2437 MHz	
2462 MHz	

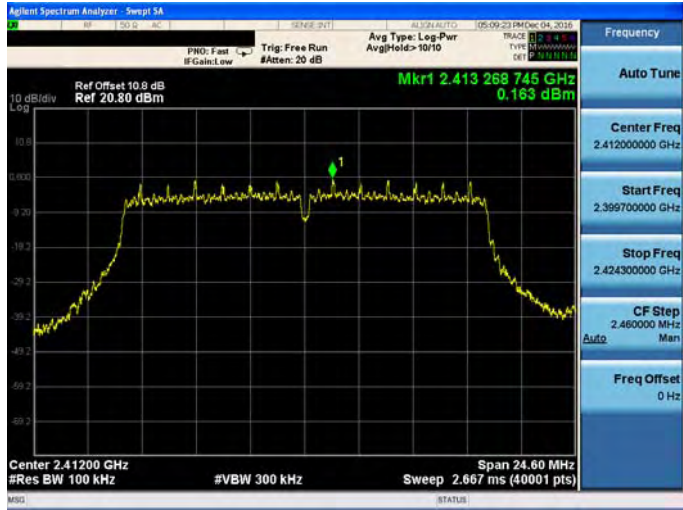
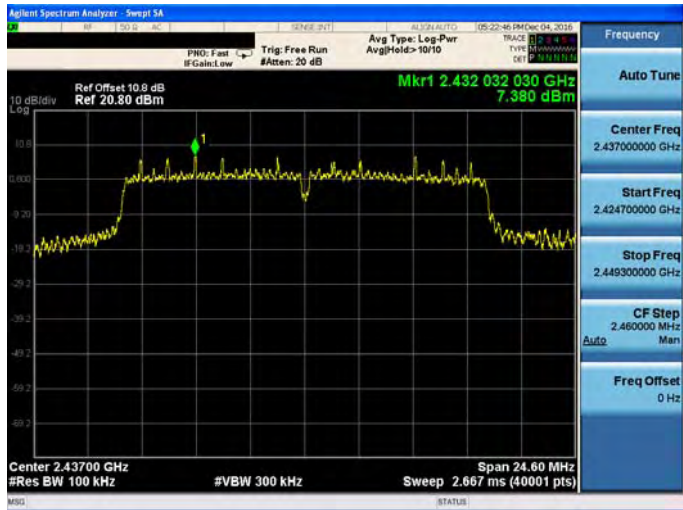
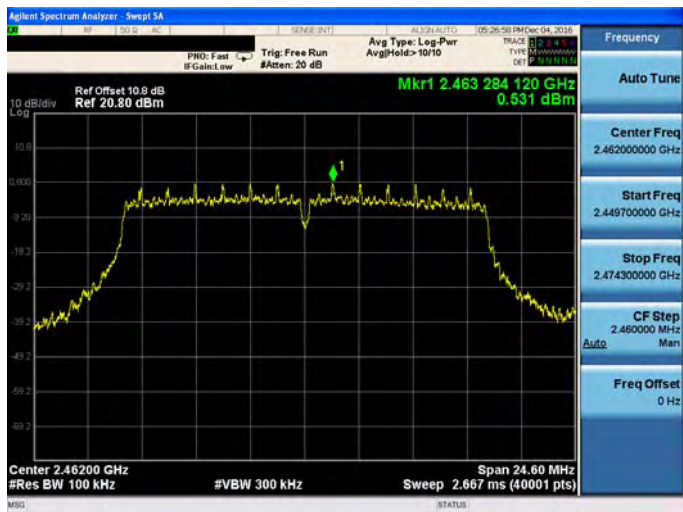


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-0
2422 MHz	
2437 MHz	
2452 MHz	

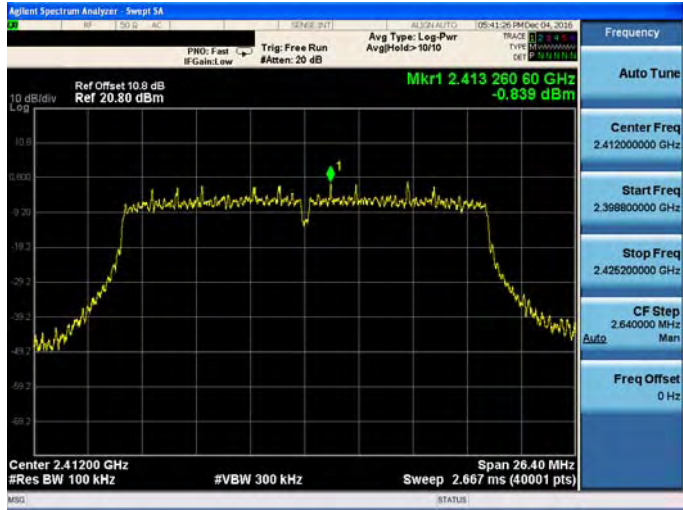
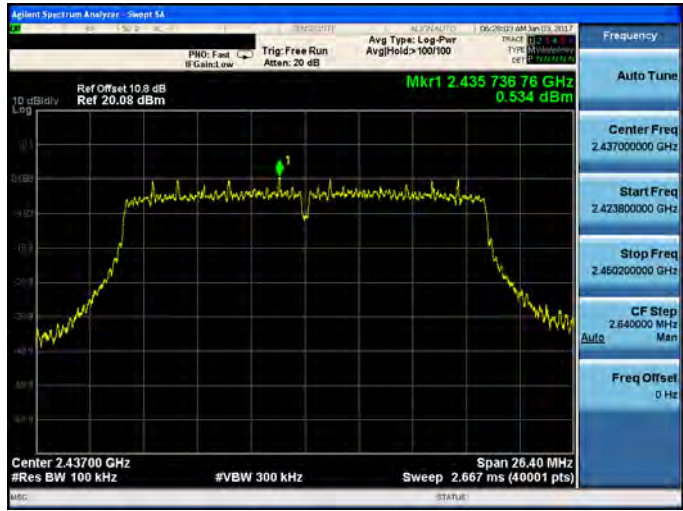
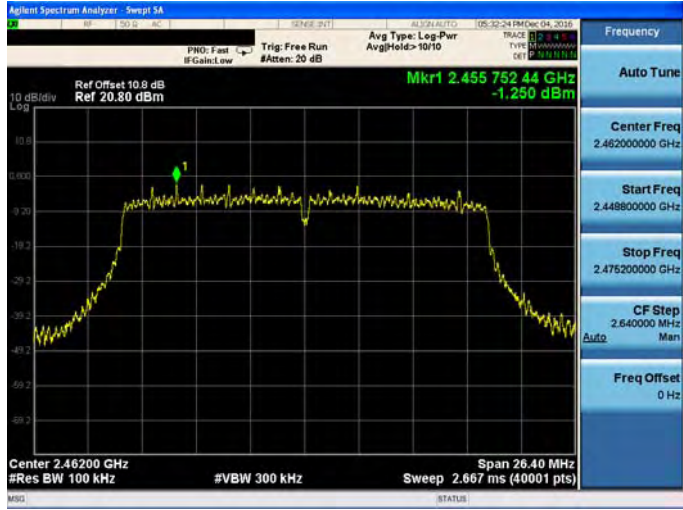


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	

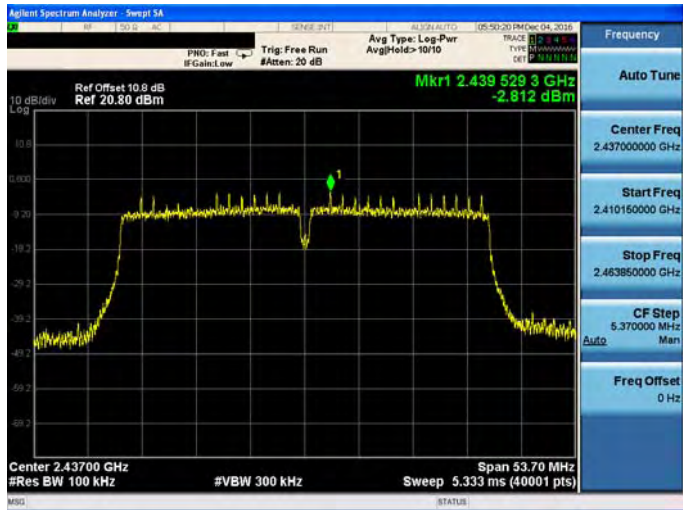
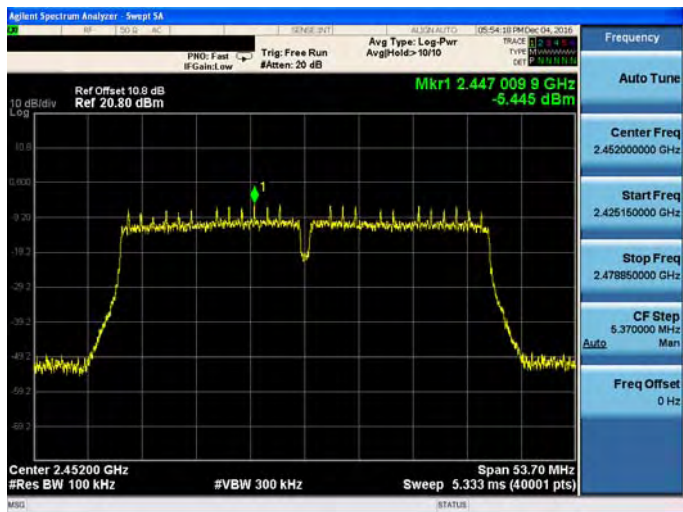


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	



Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	

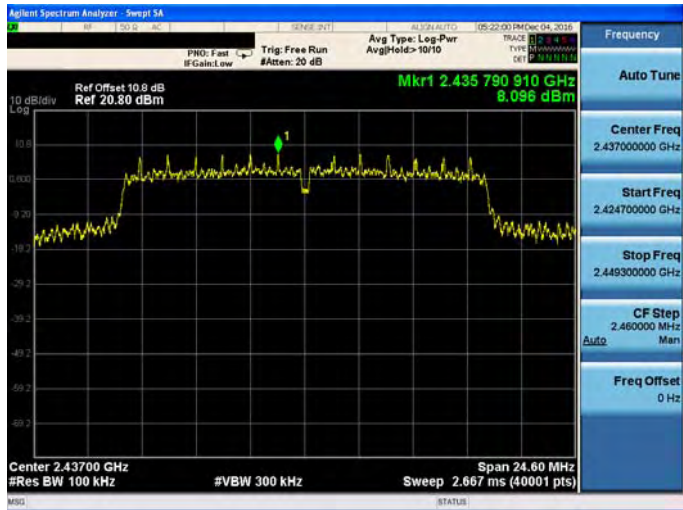
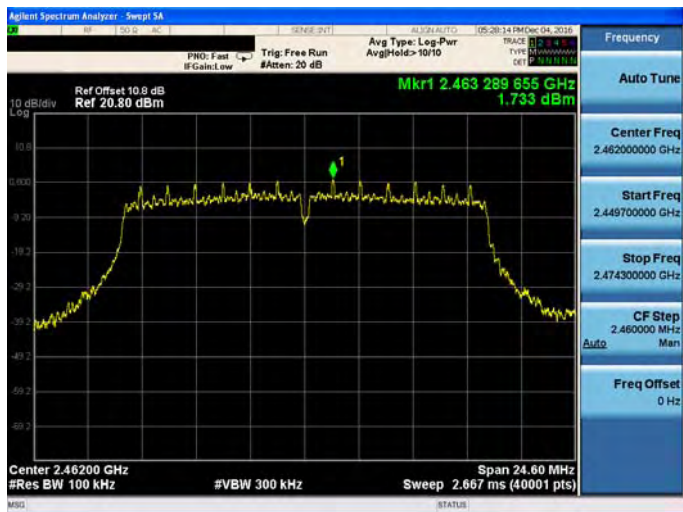


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-1
2422 MHz	
2437 MHz	
2452 MHz	

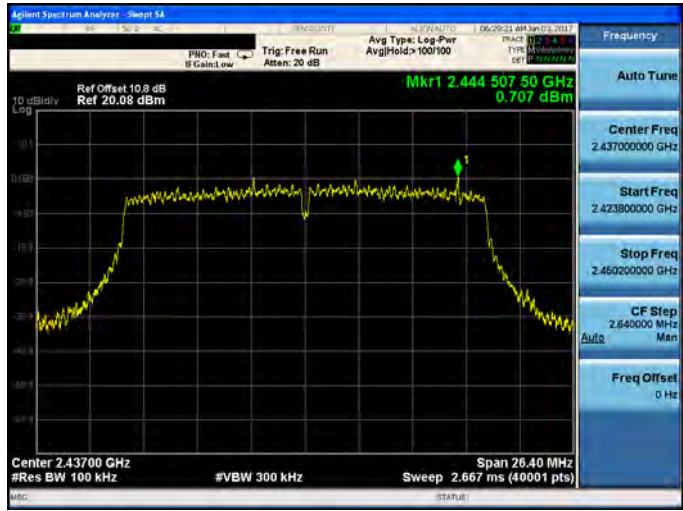
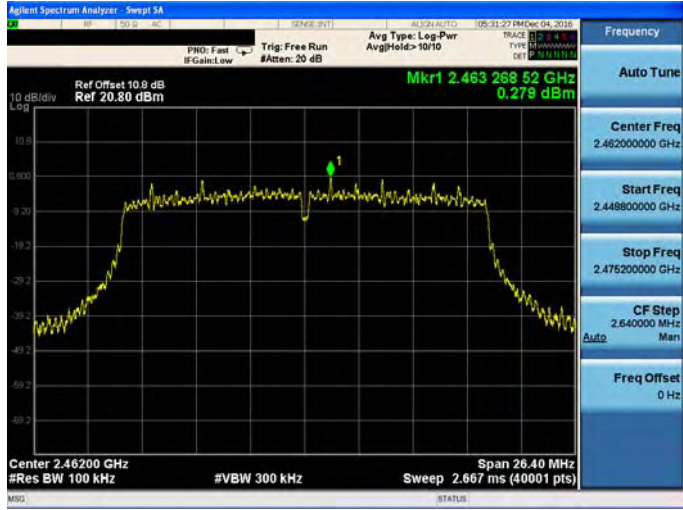


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	

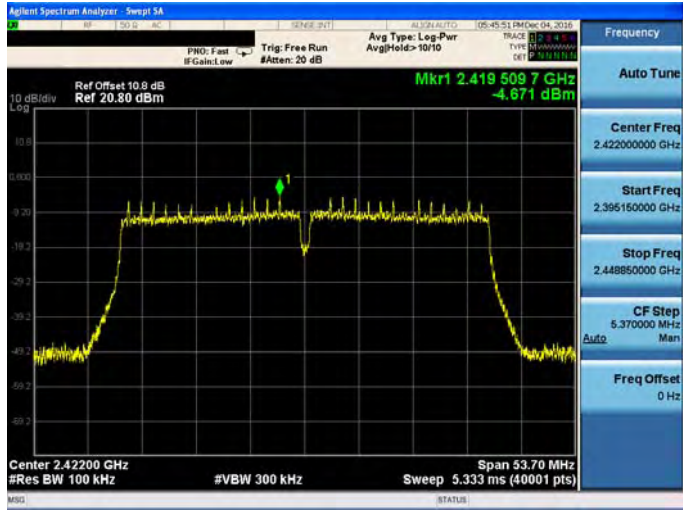
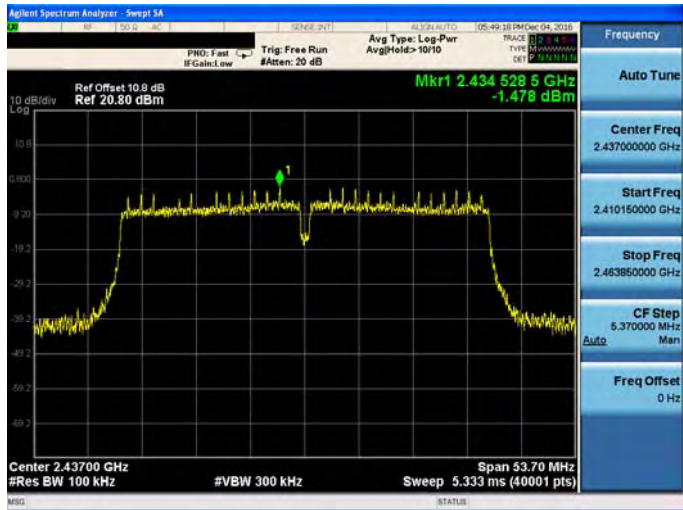
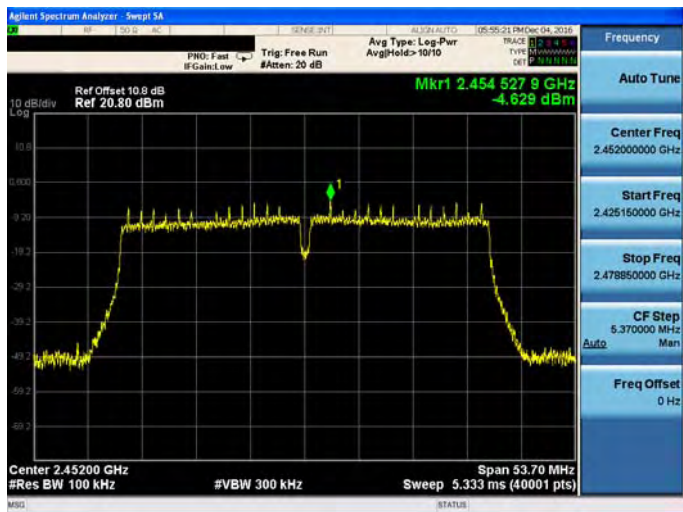


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	



Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	

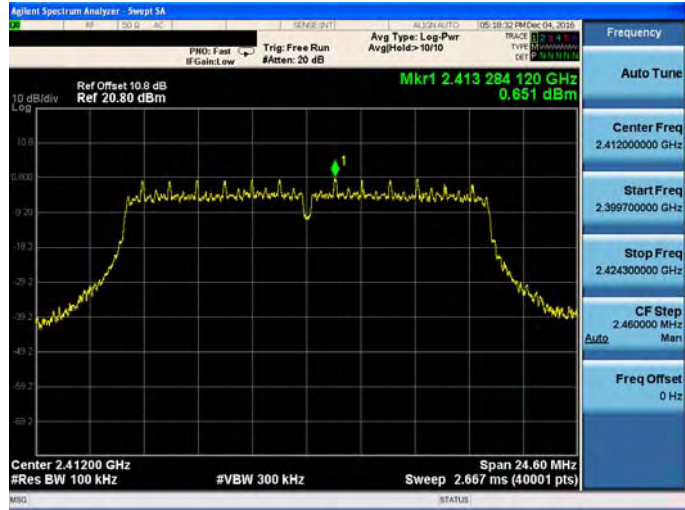
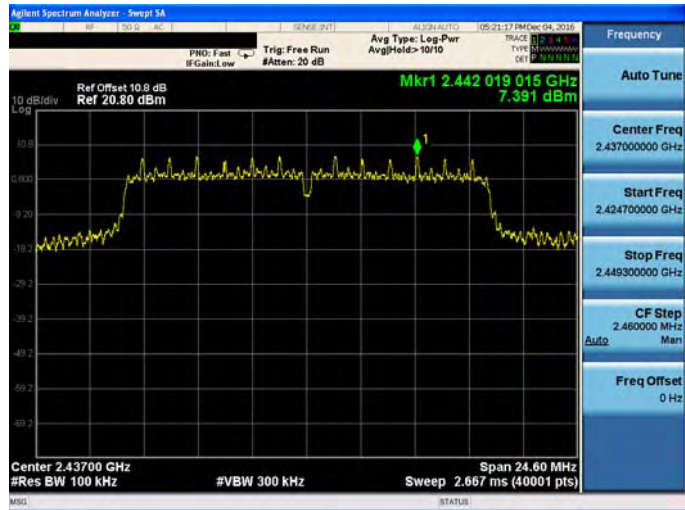
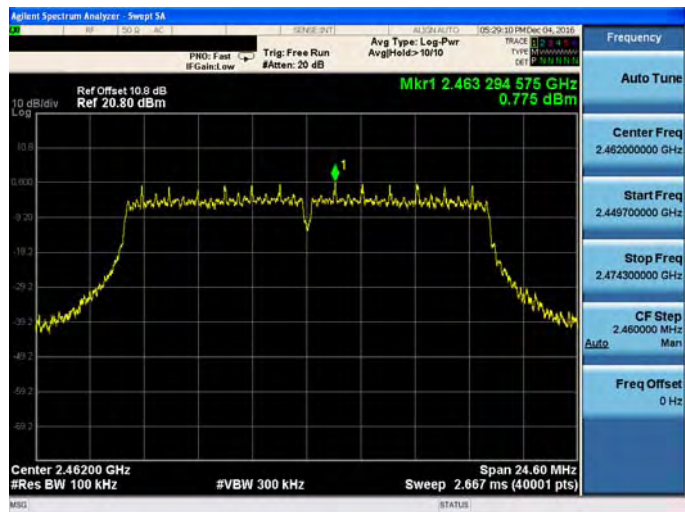


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-2
2422 MHz	
2437 MHz	
2452 MHz	

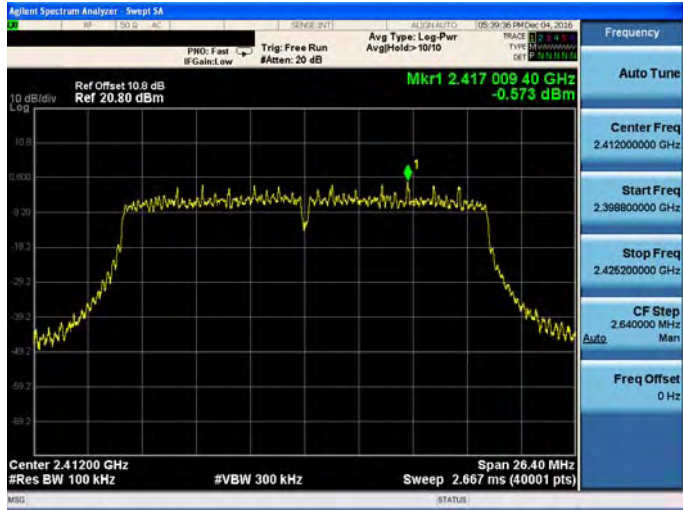
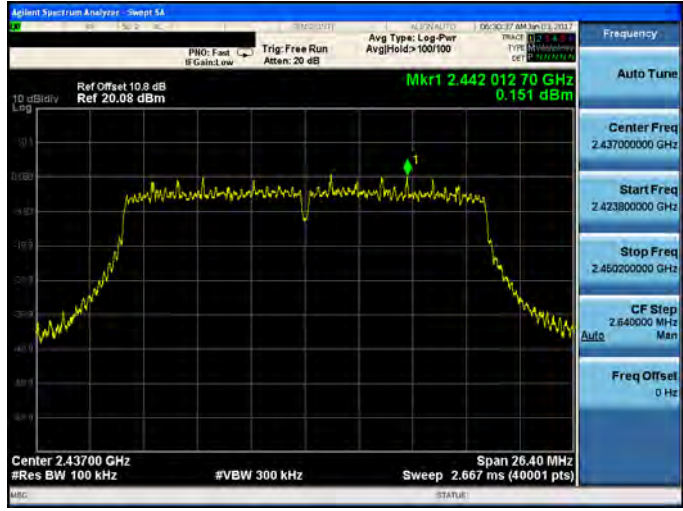
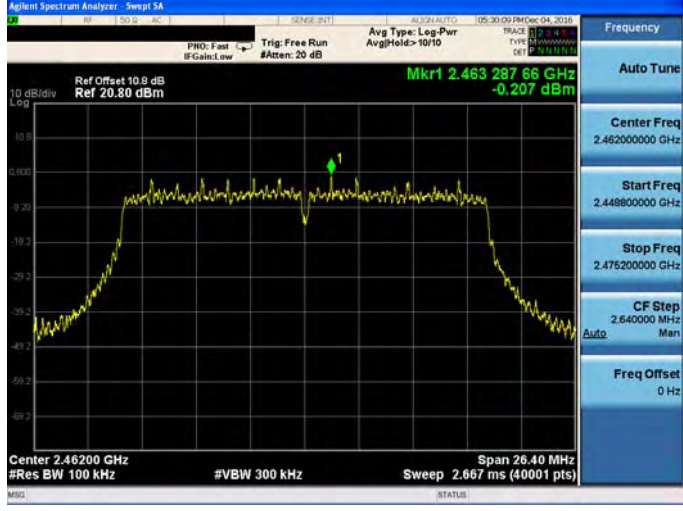


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	

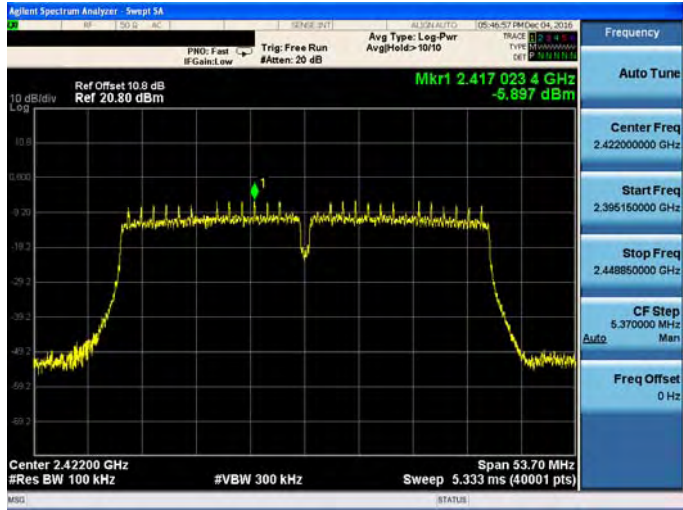
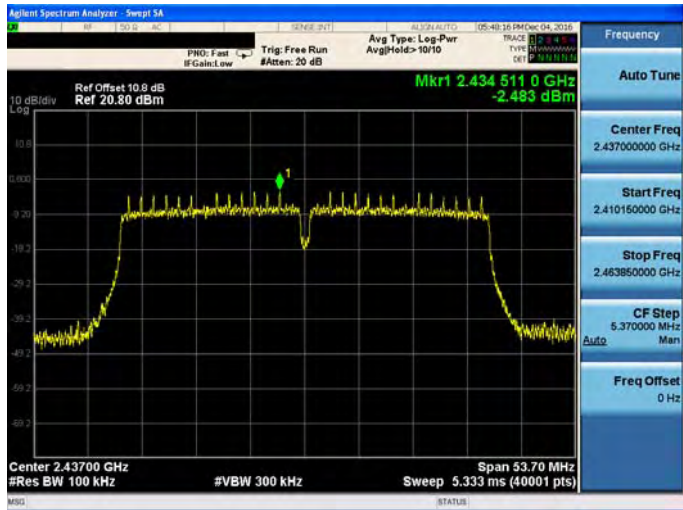
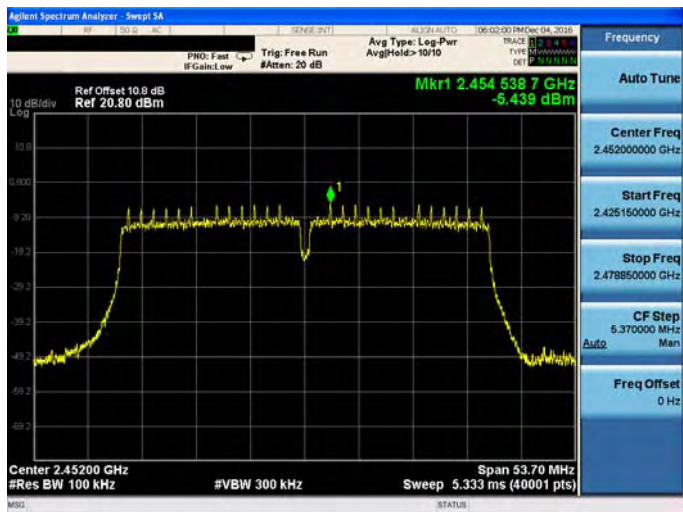


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	



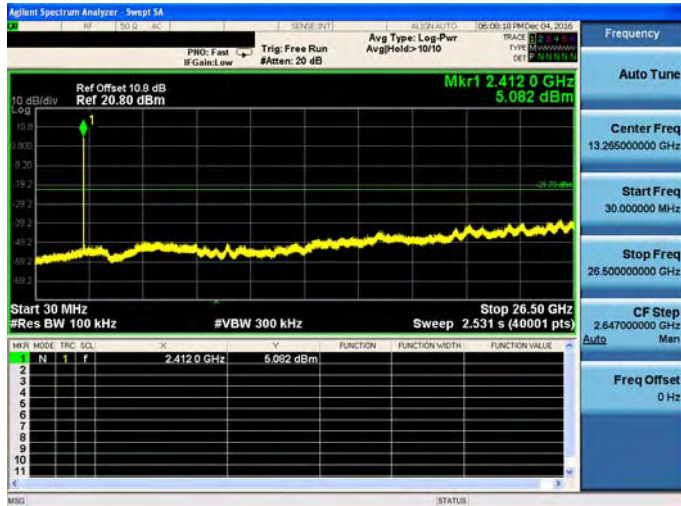
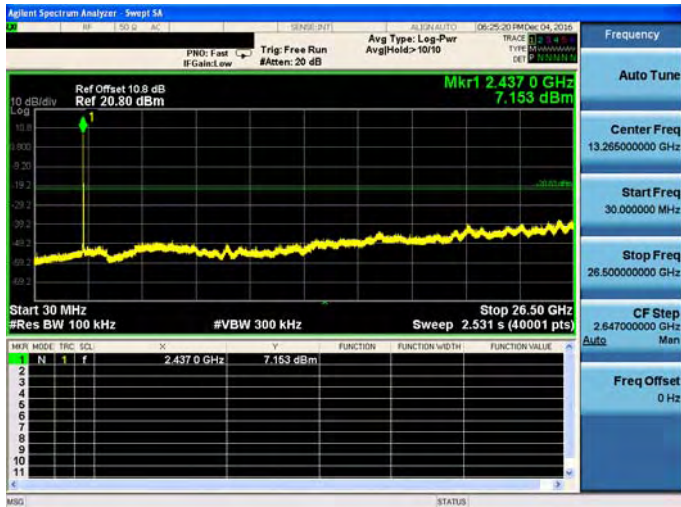
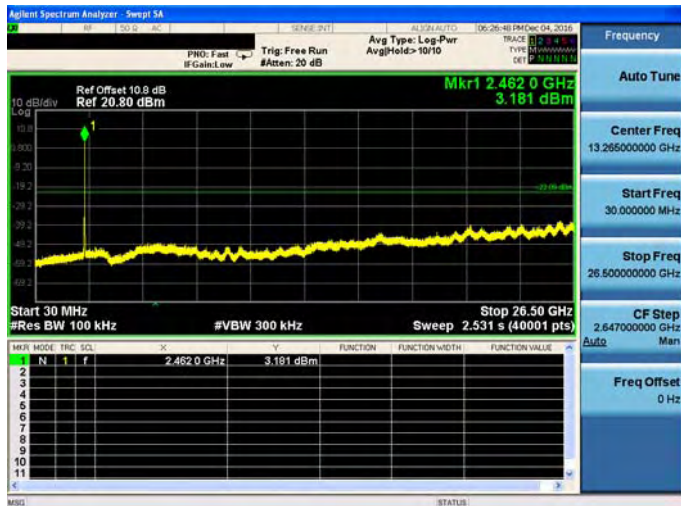
Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	



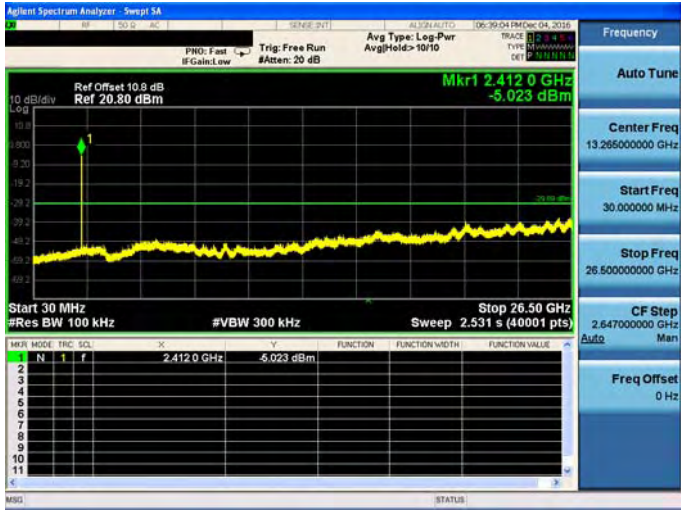
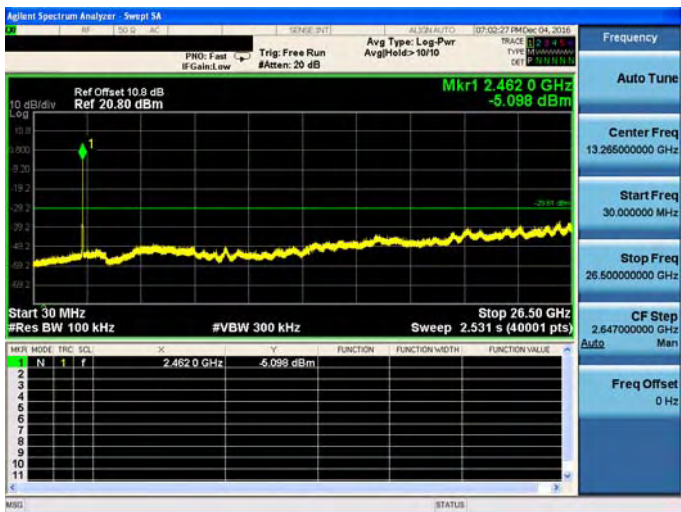
Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-3
2422 MHz	
2437 MHz	
2452 MHz	



Out of Band Conducted Emissions

Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-0
2412 MHz	
2437 MHz	
2462 MHz	

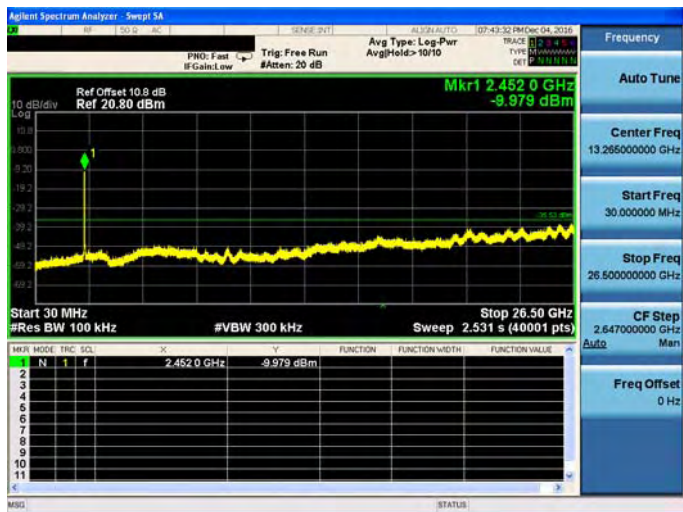


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-0
2412 MHz	
2437 MHz	
2462 MHz	

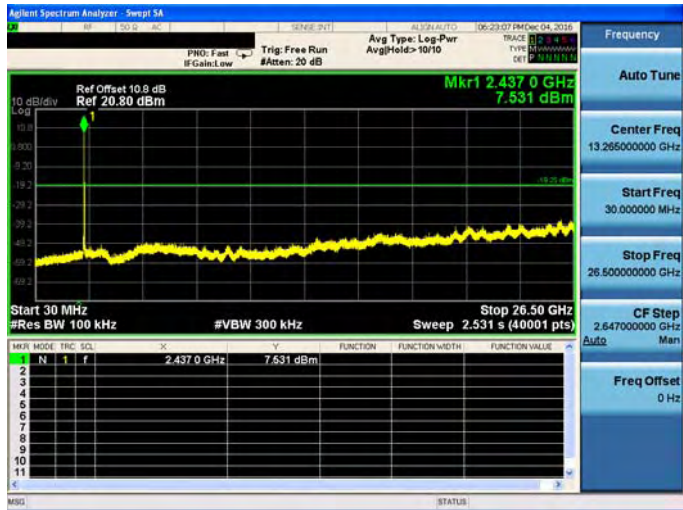


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-0
2412 MHz	
2437 MHz	
2462 MHz	

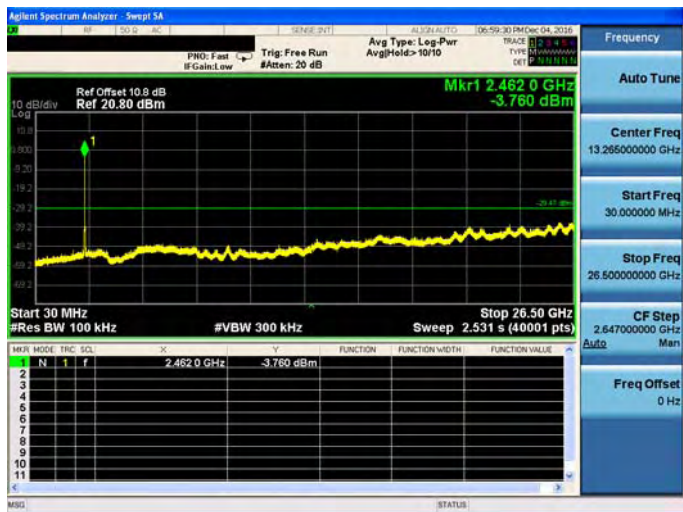


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-0
2422 MHz	
2437 MHz	
2452 MHz	



Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	

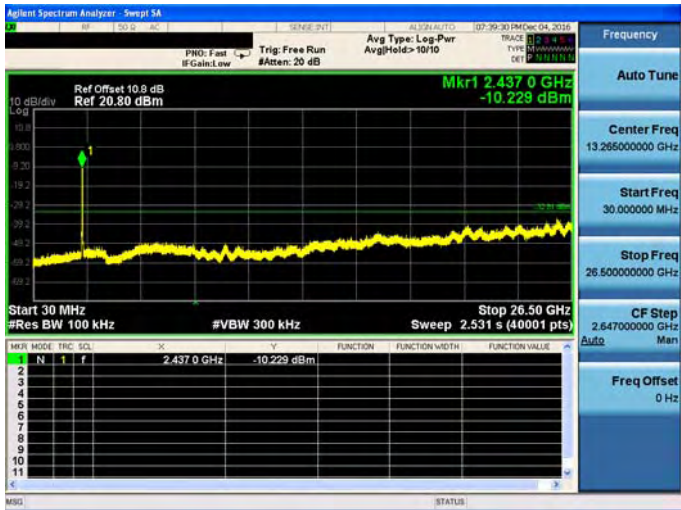
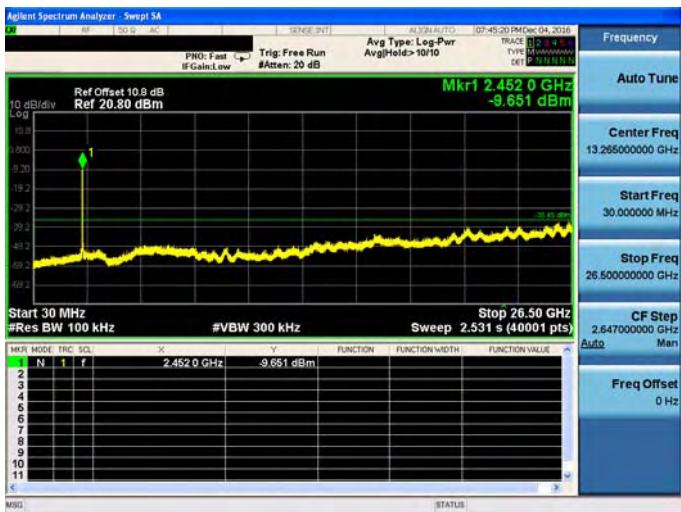


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	

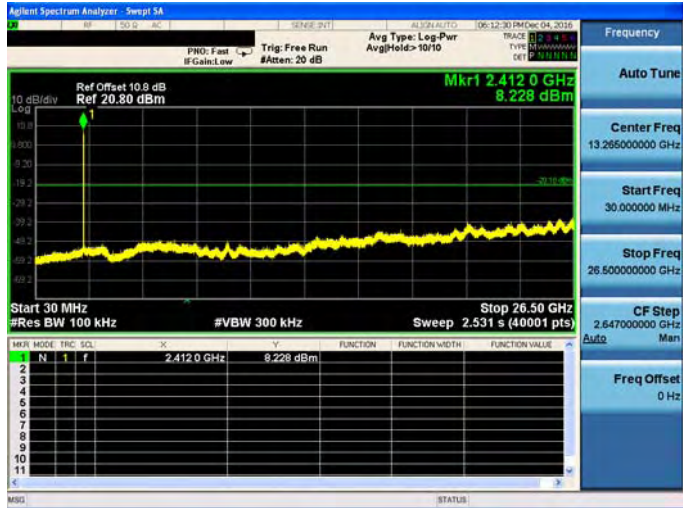
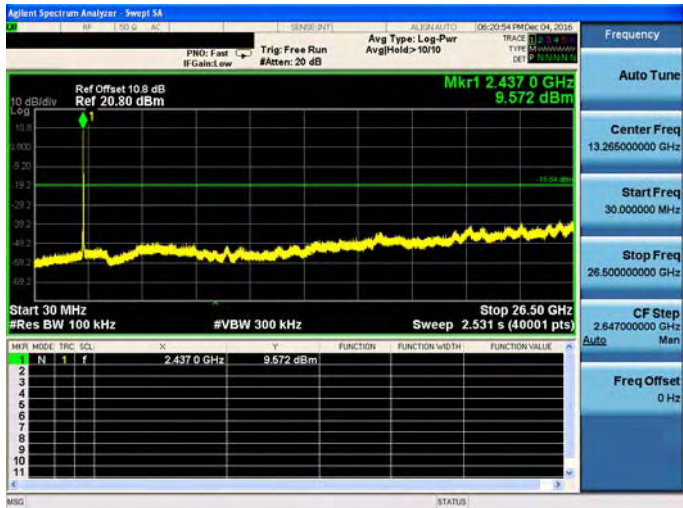
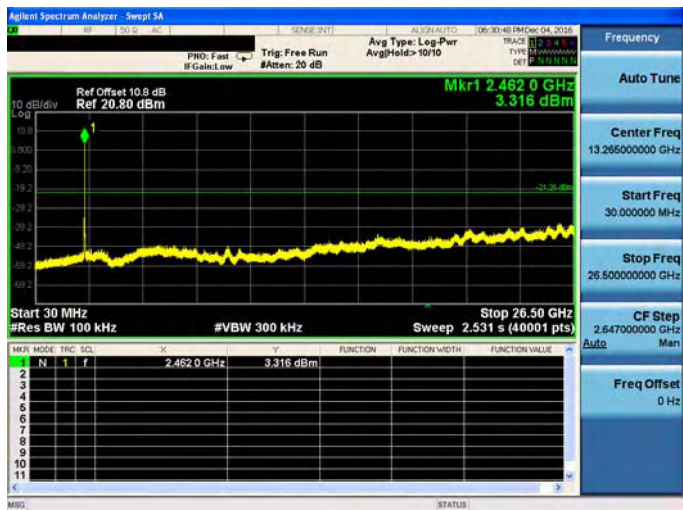


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-1
2412 MHz	
2437 MHz	
2462 MHz	



Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-1
2422 MHz	
2437 MHz	
2452 MHz	

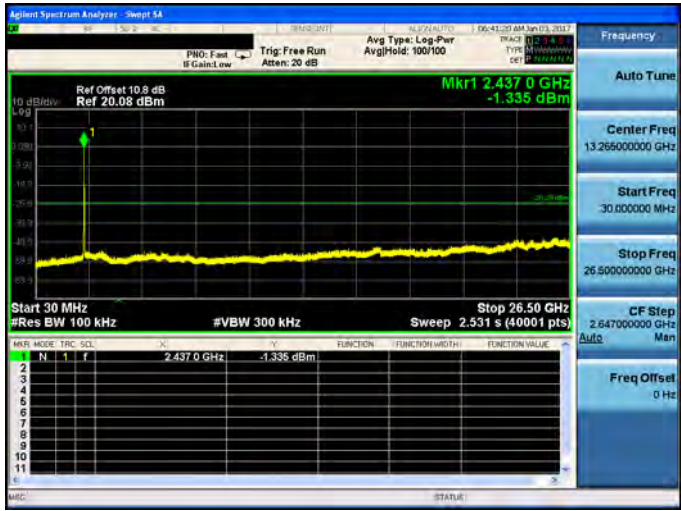


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	

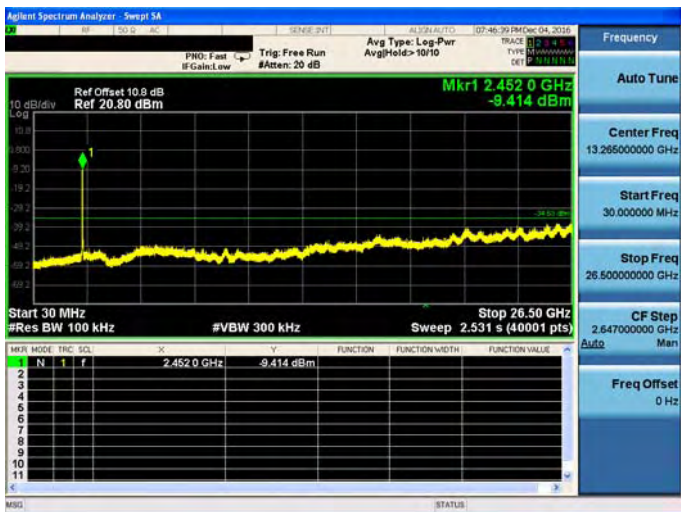


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	

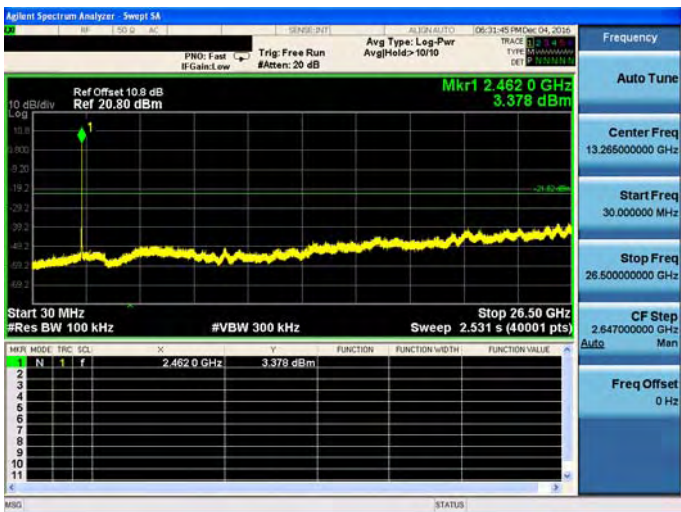


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-2
2412 MHz	
2437 MHz	
2462 MHz	

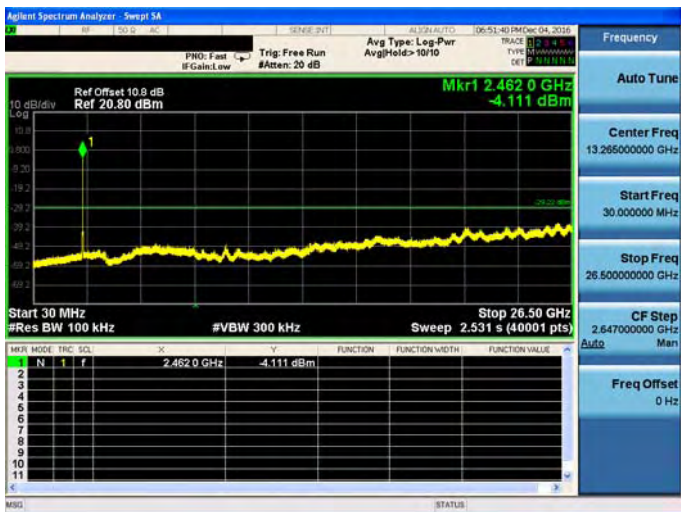


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-2
2422 MHz	
2437 MHz	
2452 MHz	



Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	

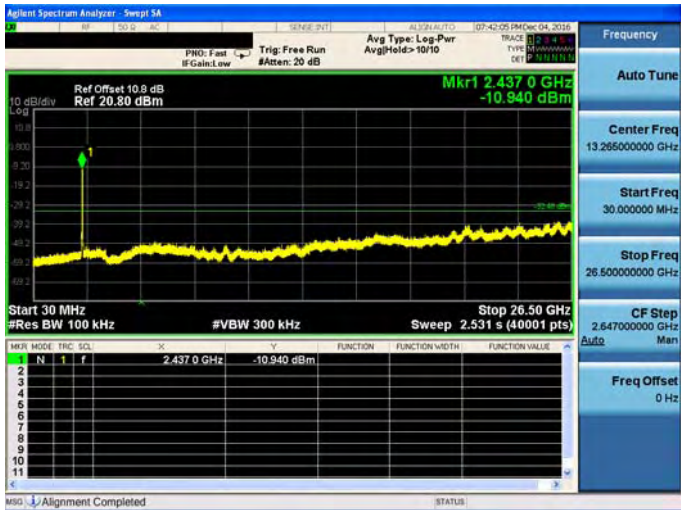
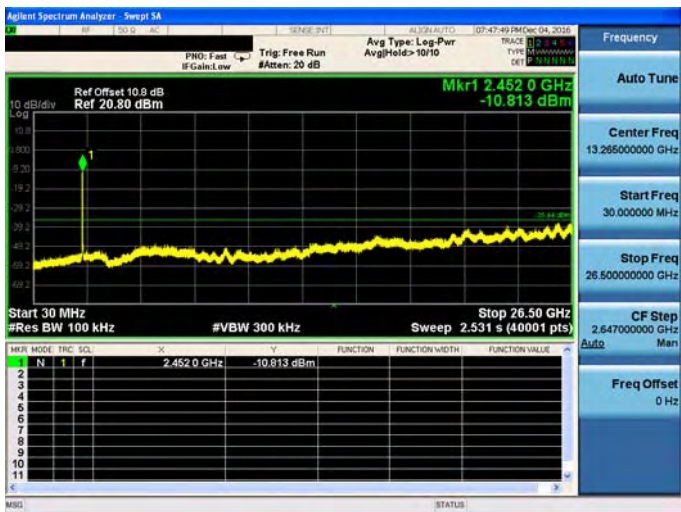


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	



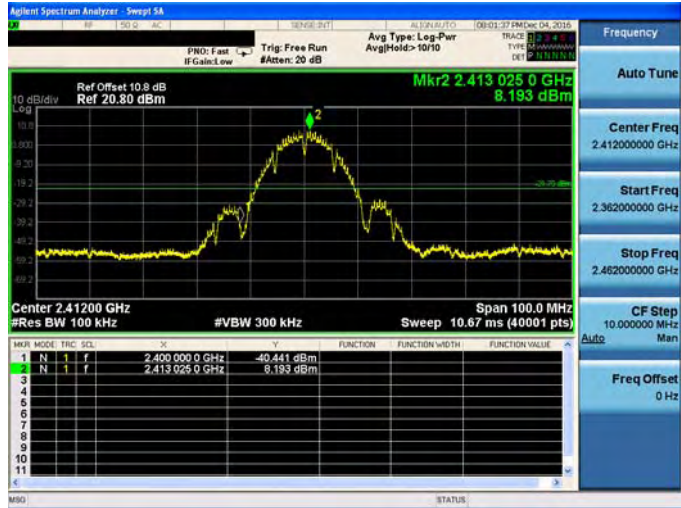
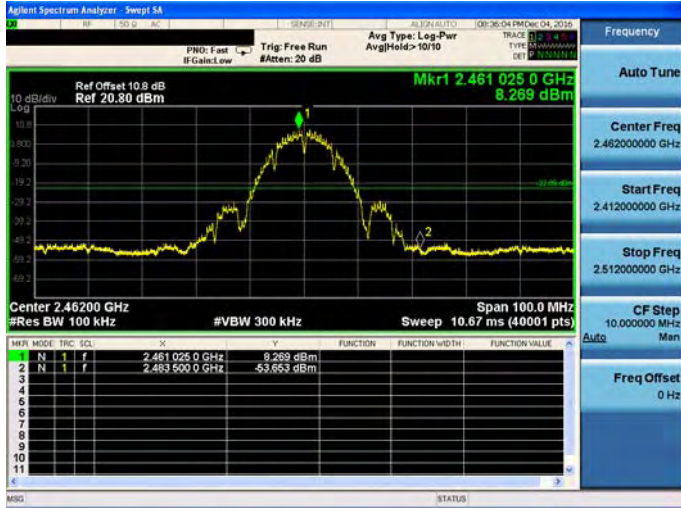
Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-3
2412 MHz	
2437 MHz	
2462 MHz	



Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-3
2422 MHz	
2437 MHz	
2452 MHz	



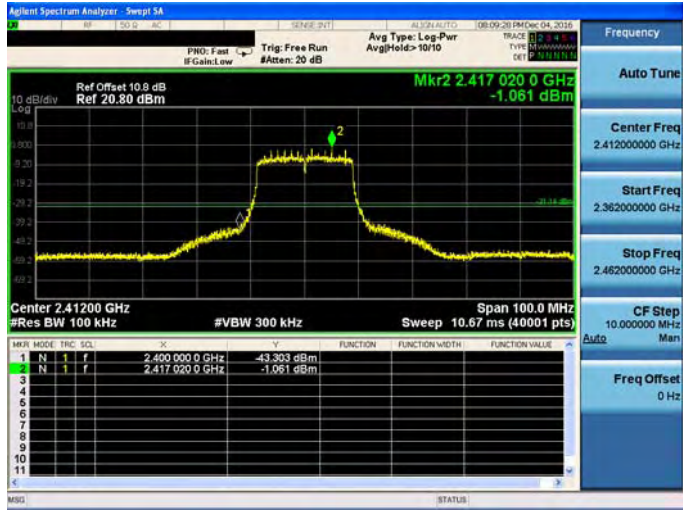
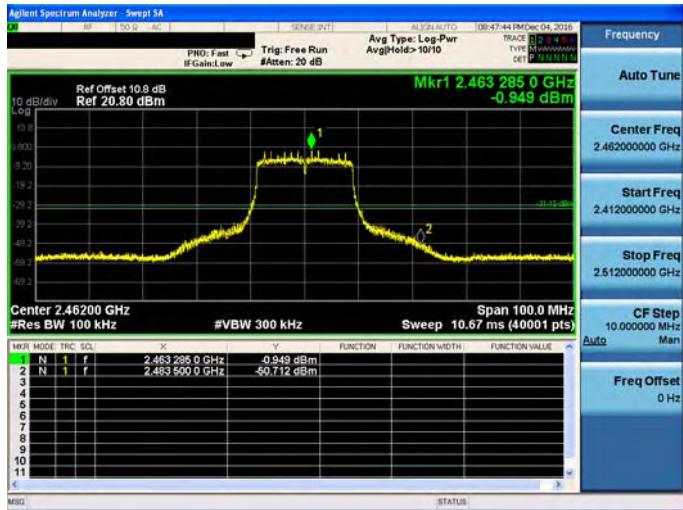
Conducted Band Edge

Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-0
2412 MHz	
2462 MHz	



Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-0
2412 MHz	
2462 MHz	

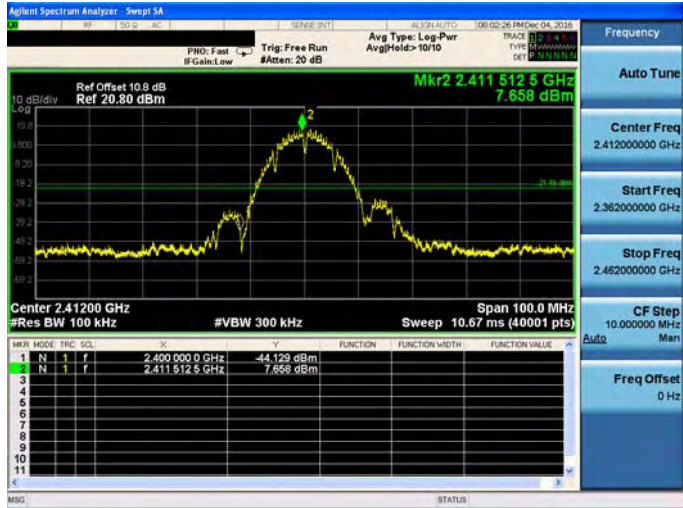
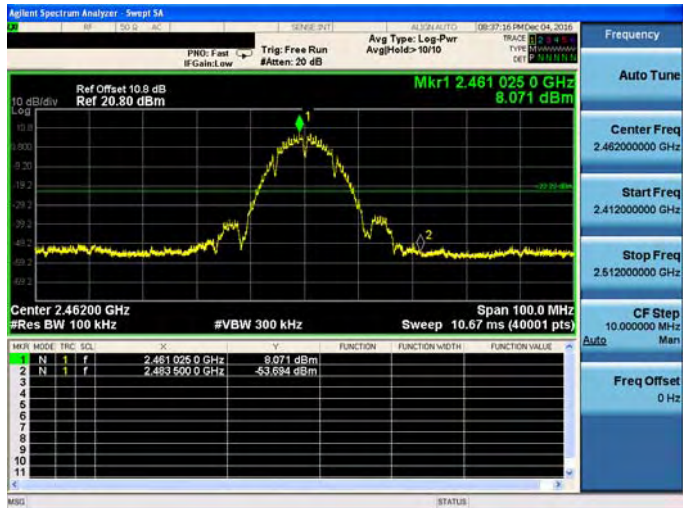


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-0
2412 MHz	
2462 MHz	

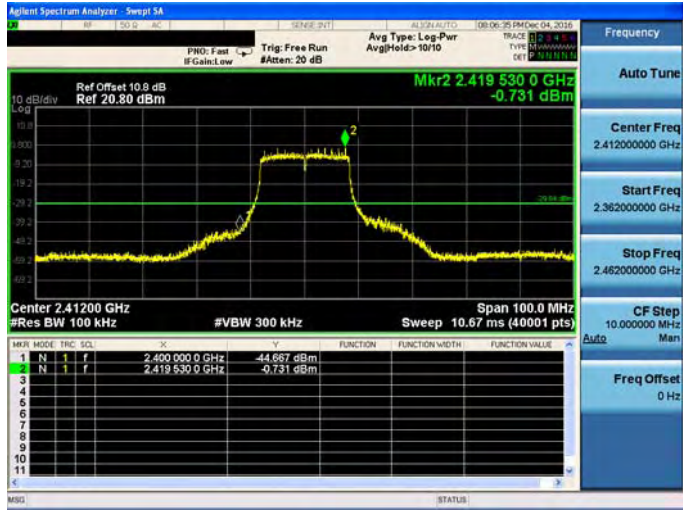
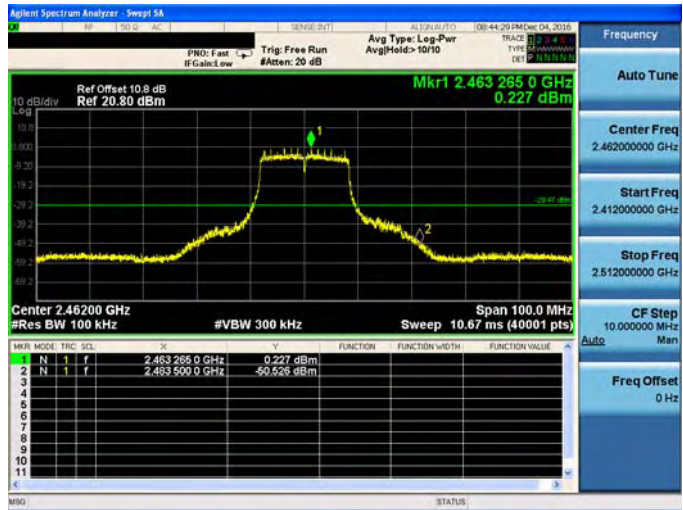


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-0
2422 MHz	
2452 MHz	



Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-1
2412 MHz	
2462 MHz	

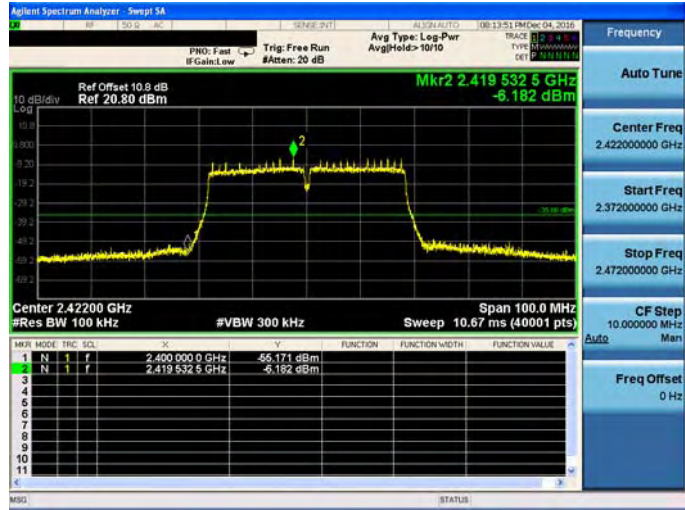
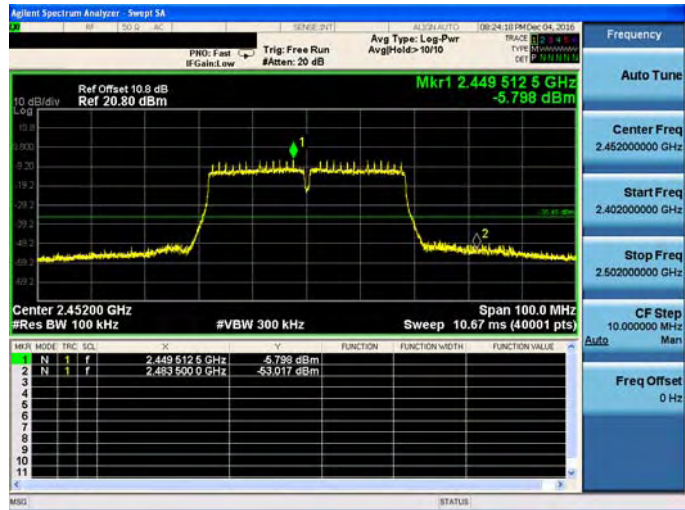


Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-1
2412 MHz	
2462 MHz	

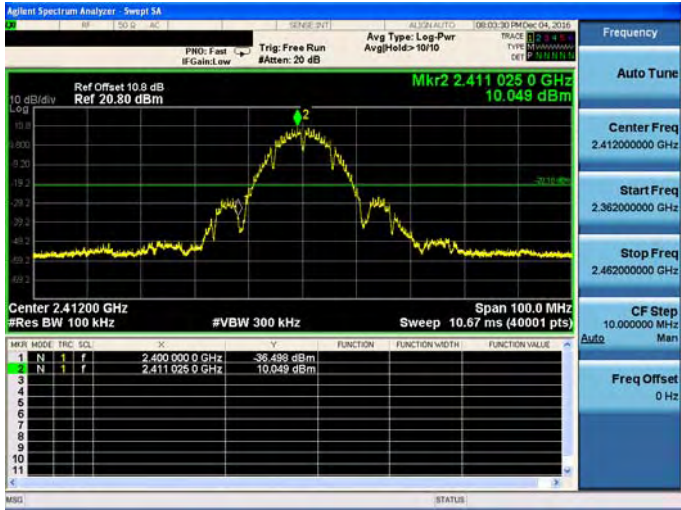
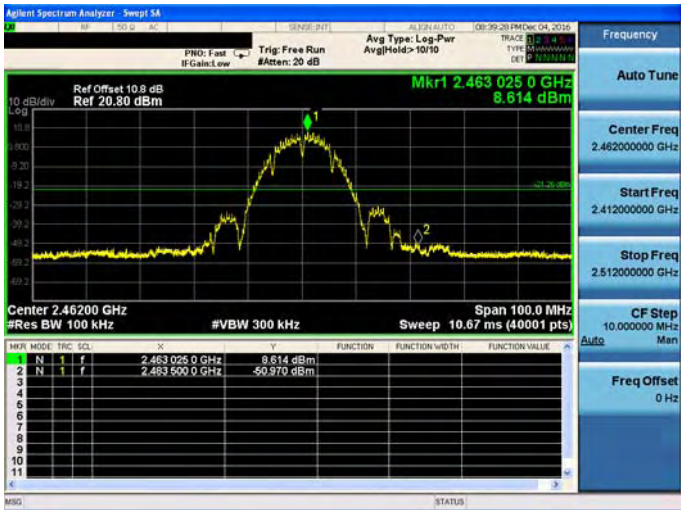


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-1
2412 MHz	
2462 MHz	

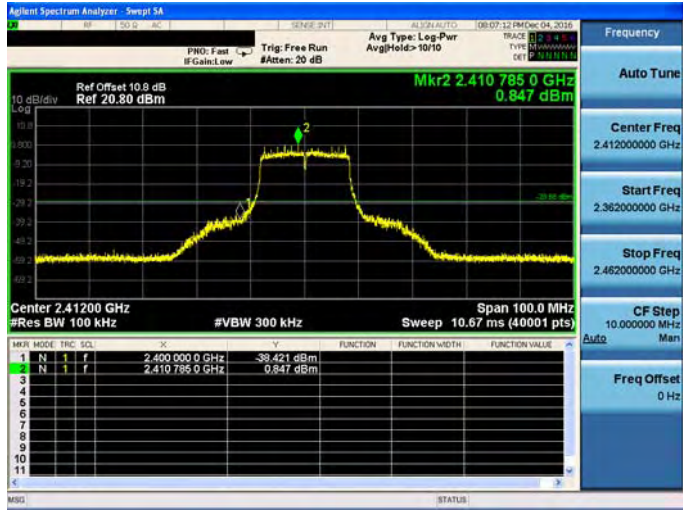
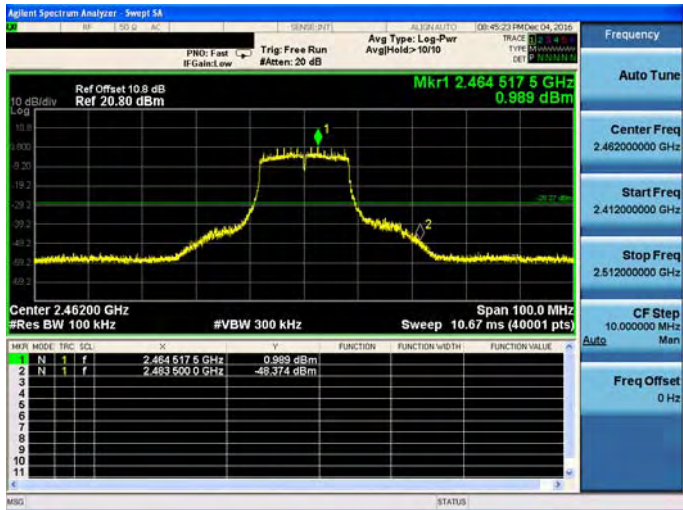


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-1
2422 MHz	
2452 MHz	

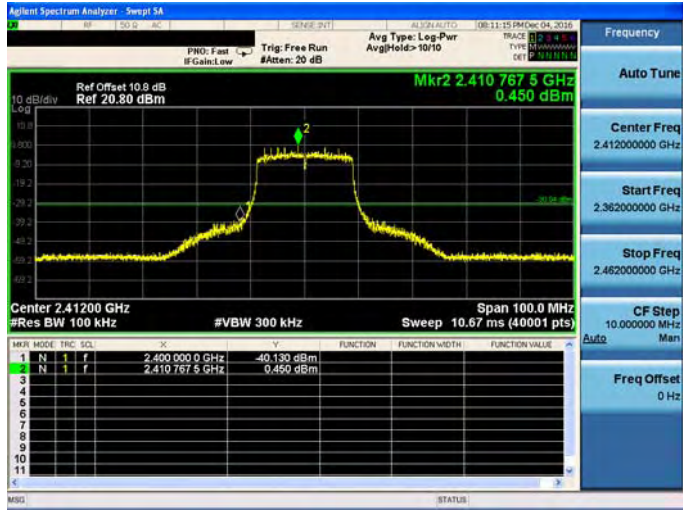
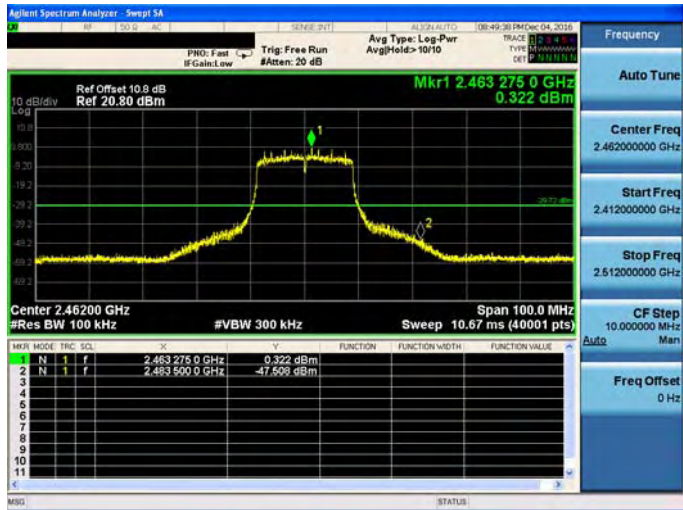


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-2
2412 MHz	
2462 MHz	



Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-2
2412 MHz	
2462 MHz	

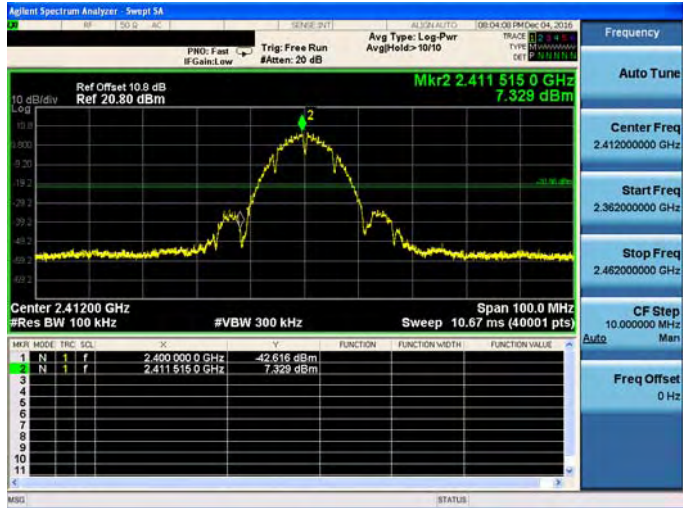
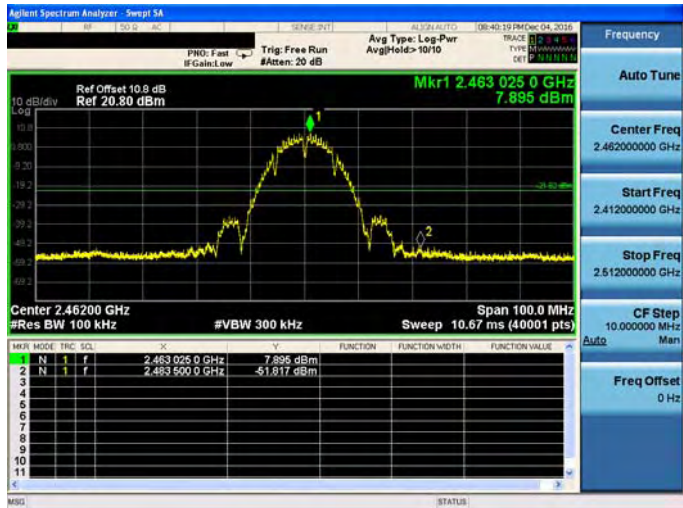


Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-2
2412 MHz	
2462 MHz	

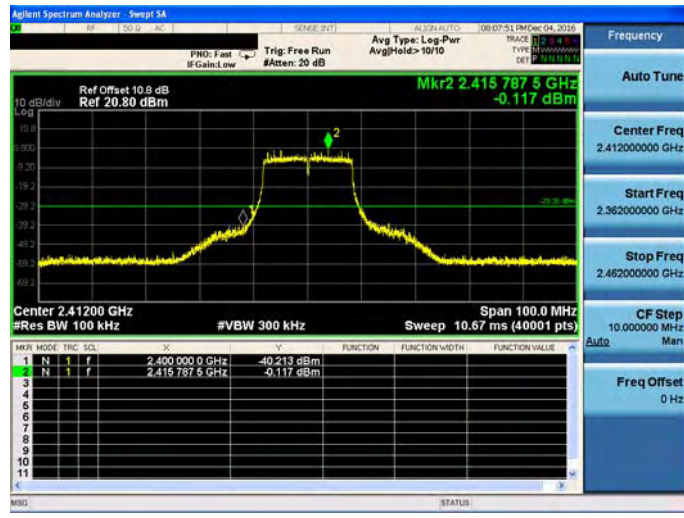
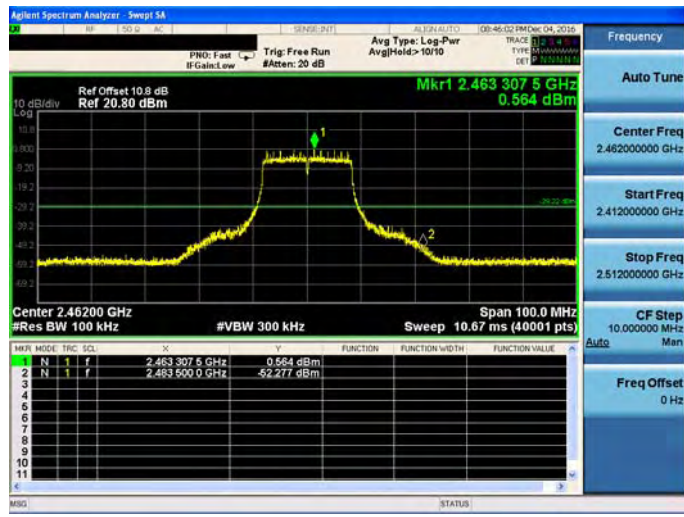


Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-2
2422 MHz	
2452 MHz	

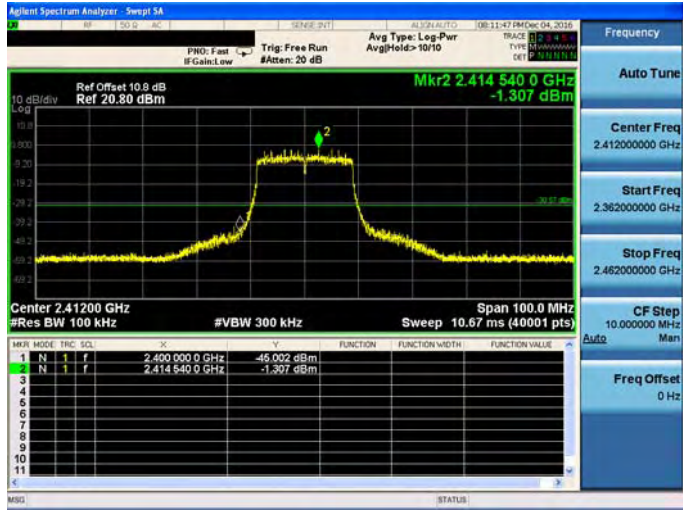
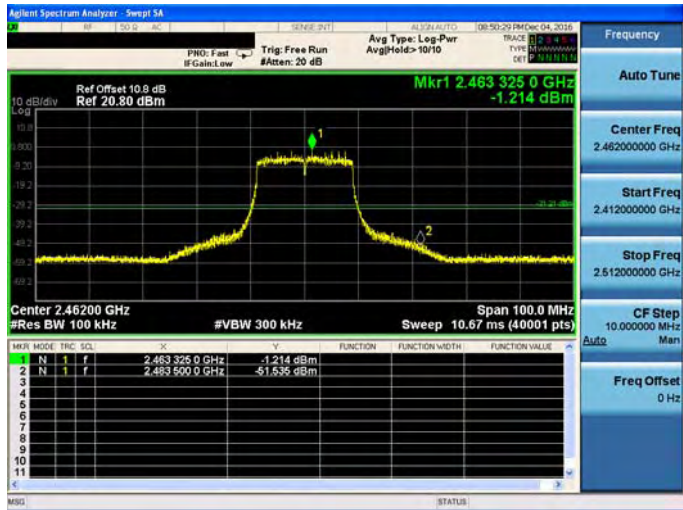


Test Mode:	Mode 2: IEEE 802.11b link mode
Antenna:	ANT-3
2412 MHz	
2462 MHz	



Test Mode:	Mode 3: IEEE 802.11g link mode
Antenna:	ANT-3
2412 MHz	
2462 MHz	



Test Mode:	Mode 4: IEEE 802.11n 2.4GHz 20MHz link mode
Antenna:	ANT-3
2412 MHz	
2462 MHz	



Test Mode:	Mode 5: IEEE 802.11n 2.4GHz 40MHz link mode
Antenna:	ANT-3
2422 MHz	
2452 MHz	



10 Antenna Measurement

■ Limit

For intentional device, according to 15.203, 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.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

■ Antenna Description

See section 2 – antenna information.

■ Directional Gain Calculated

For Maximum Conducted Output Power

$$\text{Directional Gain} = 10 \cdot \log\{[10^{(G1/20)} + 10^{(G2/20)} + \dots + 10^{(Gn/20)}]^2 / NANT\}$$

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11n 2.4GHz 20MHz	12.02
IEEE 802.11n 2.4GHz 40MHz	12.02

For Maximum Power Density

$$\text{Directional Gain} = 10 \cdot \log\{[10^{(G1/20)} + 10^{(G2/20)} + \dots + 10^{(Gn/20)}]^2 / NANT\}$$

Operate Freq. Band	Directional Gain (dBi)
IEEE 802.11b link mode	12.02
IEEE 802.11g link mode	12.02
IEEE 802.11n 2.4GHz 20MHz	12.02
IEEE 802.11n 2.4GHz 40MHz	12.02