6.5. Power Spectral Density

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)/RSS-247, 5.2(2)
Test Method:	KDB558074, KDB662911
Limit:	The Average power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows Measurement Procedure 10.3 Method AVGPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v03r05 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 5. Detector = RMS, Sweep time = auto couple. 6. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 12, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RFC-01	N/A	Aug. 12, 2017

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to*

international system unit (SI).

6.5.3. Test data

Configuration IEEE 802.11b/ Antenna 0, Antenna 1, Antenna 2						
Test channel	AVG Power Spectral Density (dBm/3kHz)				Limit (dBm)	Result
	Ant0	Ant1	Ant2	Total		
Lowest	-10.01	-10.70	-10.80	-5.72	6.2dBm/3kHz	PASS
Middle	-12.91	-13.50	-13.01	-8.36	6.2dBm/3kHz	PASS
Highest	-11.29	-11.36	-11.00	-6.44	6.2dBm/3kHz	PASS

Configuration IEEE 802.11g/ Antenna 0, Antenna 1, Antenna 2						
Test channel	AVG Power Spectral Density (dBm/3kHz)				Limit (dBm)	Result
	Ant0	Ant1	Ant2	Total		
Lowest	-12.24	-15.85	-16.06	-9.57	6.2dBm/3kHz	PASS
Middle	-17.26	-16.55	-17.03	-12.17	6.2dBm/3kHz	PASS
Highest	-15.00	-15.39	-15.65	-10.57	6.2dBm/3kHz	PASS

Configuration IEEE 802.11n (HT20)/ Antenna 0, Antenna 1, Antenna 2						
Test channel	AVG Power Spectral Density (dBm/3kHz)				Limit (dBm)	Result
	Ant0	Ant1	Ant2	Total		
Lowest	-15.69	-16.02	-15.59	-10.99	6.2dBm/3kHz	PASS
Middle	-16.82	-16.74	-16.11	-11.77	6.2dBm/3kHz	PASS
Highest	-14.69	-15.67	-15.32	-10.44	6.2dBm/3kHz	PASS

Configuration IEEE 802.11n (HT40)/ Antenna 0, Antenna 1, Antenna 2						
Test channel	AVG Power Spectral Density (dBm/3kHz)				Limit (dBm)	Result
	Ant0	Ant1	Ant2	Total		
Lowest	-17.58	-17.62	-17.82	-12.90	6.2dBm/3kHz	PASS
Middle	-19.49	-19.15	-19.03	-14.45	6.2dBm/3kHz	PASS
Highest	-18.17	-16.55	-17.09	-12.45	6.2dBm/3kHz	PASS

***Note*: G_{ANT} =3dBi, Array Gain=10log(N_{ANT}/N_{SS})=4.8dBi**

Directional Gain=G_{ANT} + Array Gain=7.8dBi, So limit=8-(7.8-6)=6.2dBm/3kHz

Test plots as follows:

Antenna 0:
802.11b Modulation

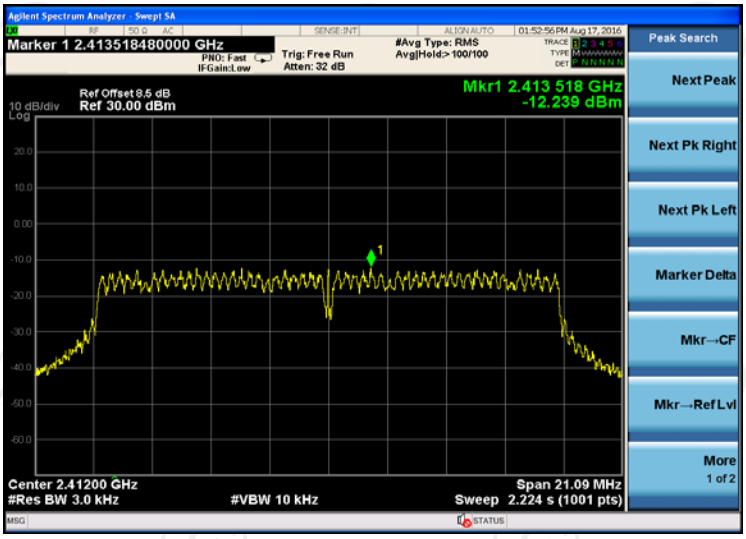
Lowest channel

Middle channel

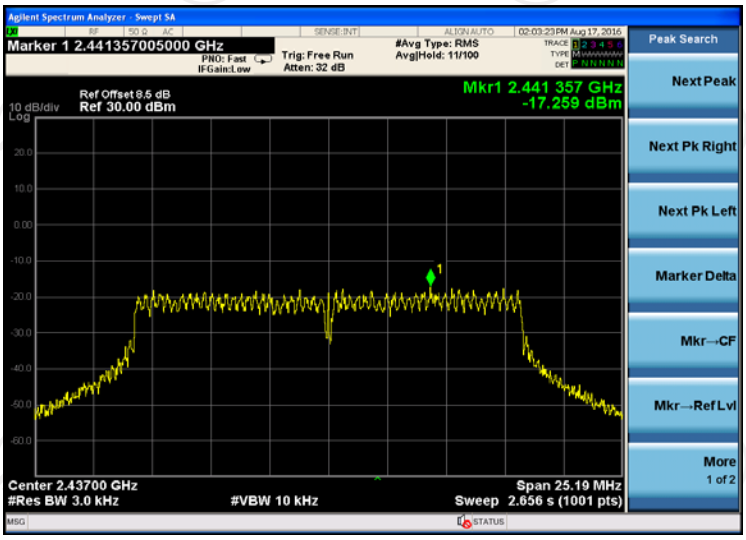
Highest channel

802.11g Modulation

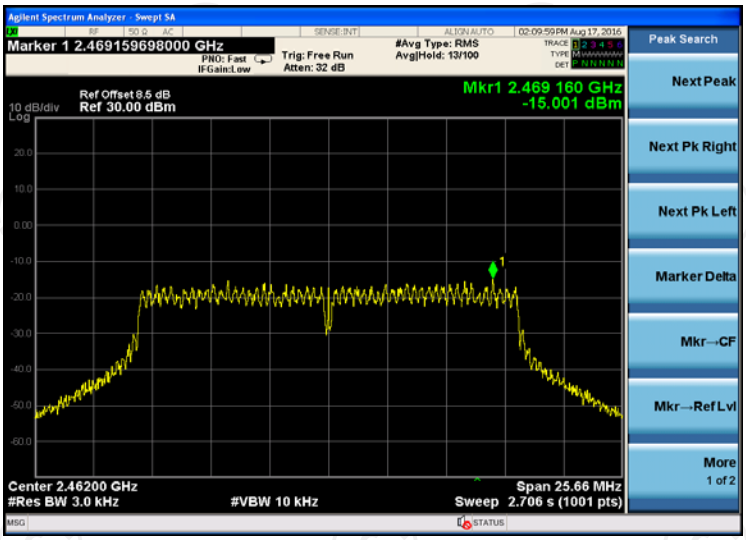
Lowest channel



Middle channel

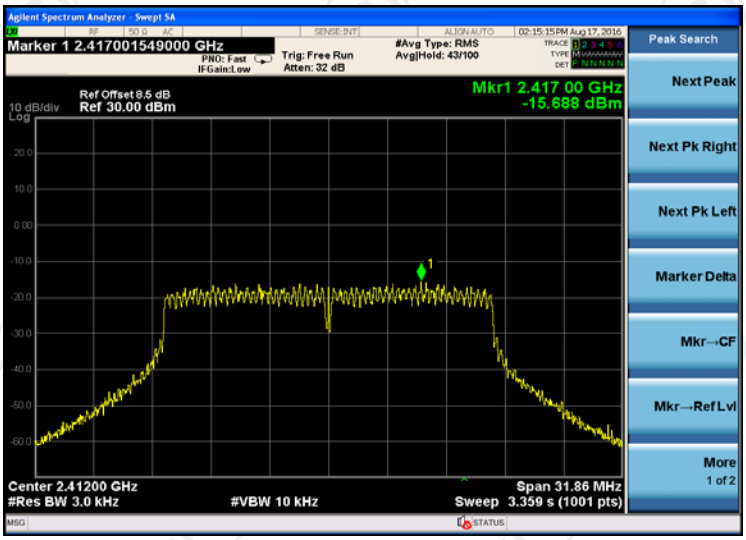


Highest channel

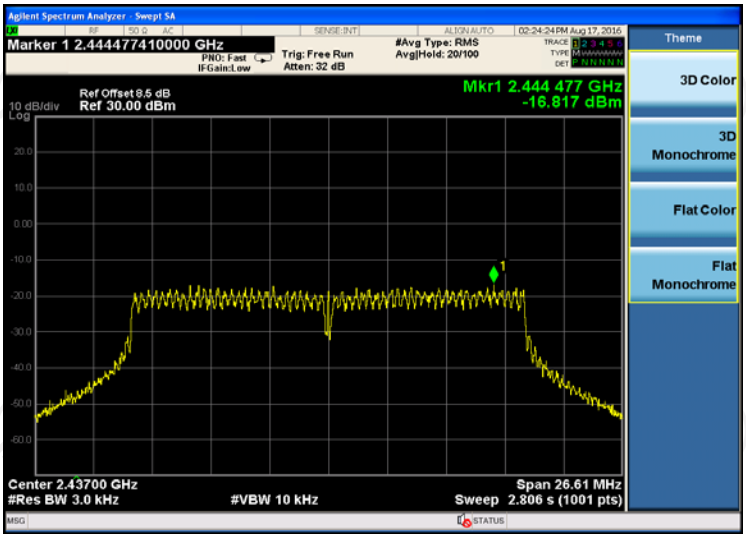


802.11n (HT20) Modulation

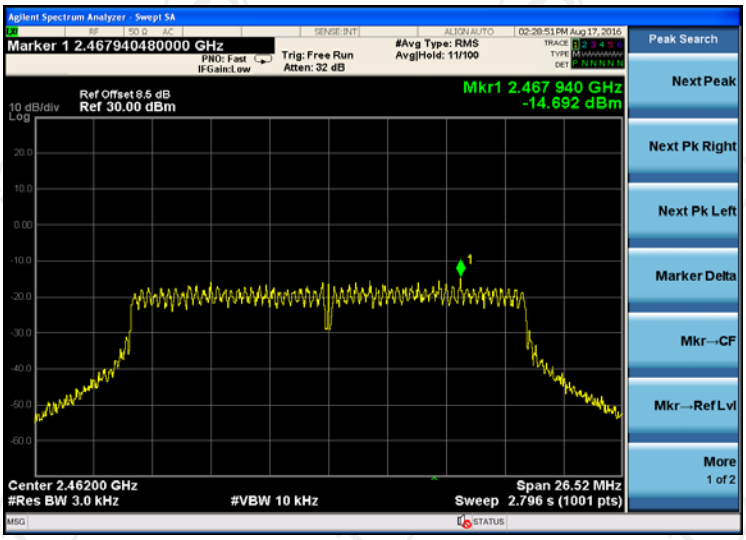
Lowest channel



Middle channel

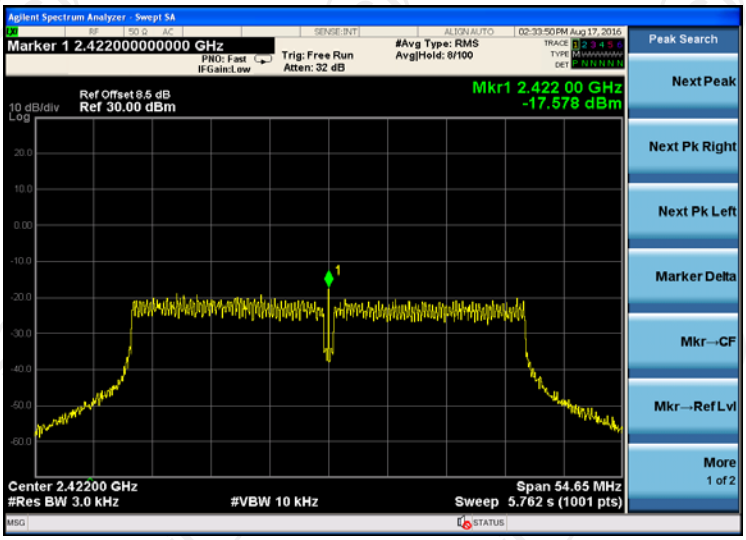


Highest channel

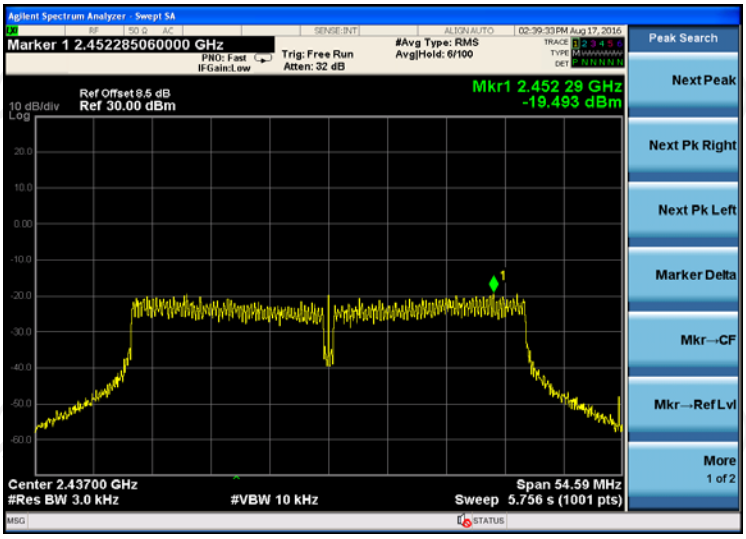


802.11n (HT40) Modulation

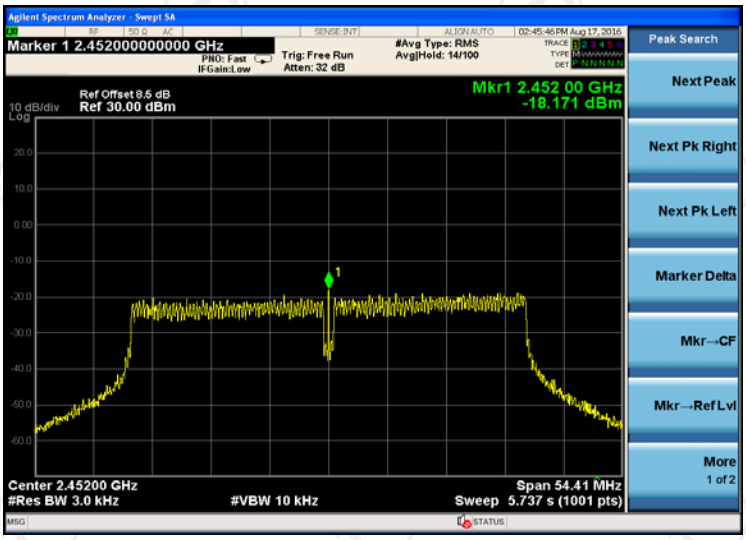
Lowest channel



Middle channel

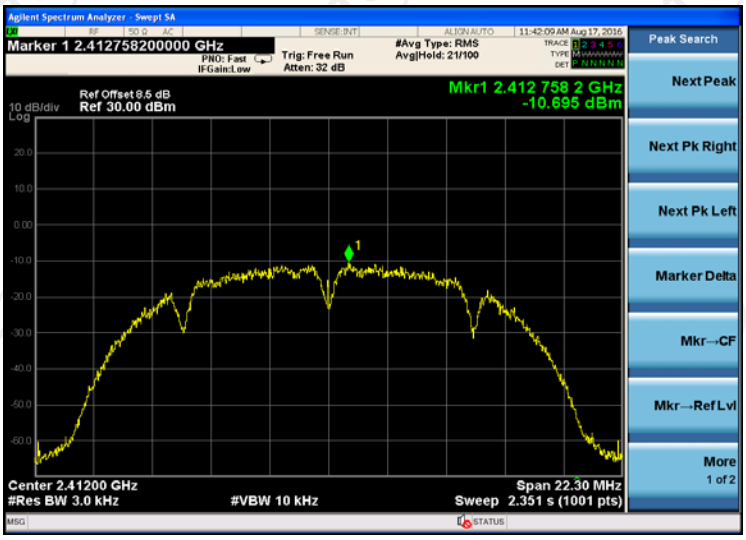


Highest channel



Antenna 1:
802.11b Modulation

Lowest channel

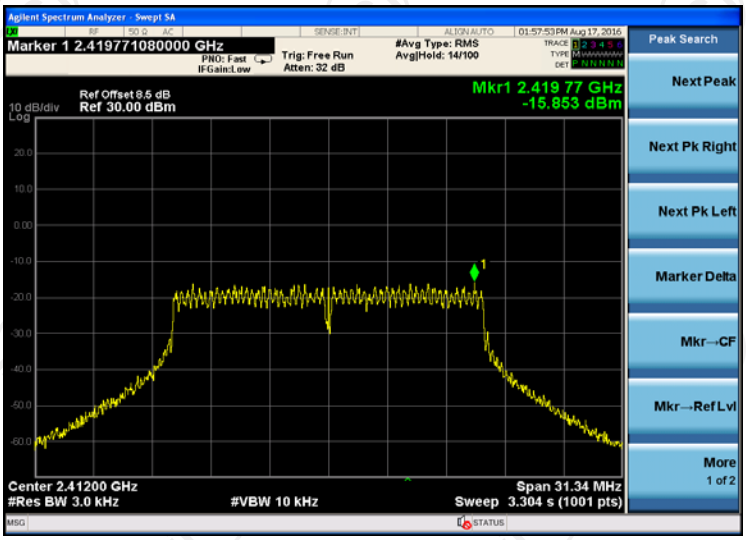


Middle channel

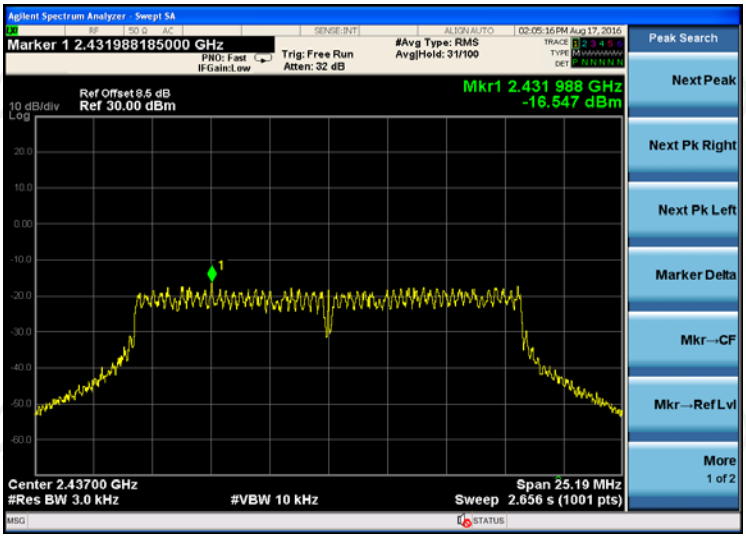
Highest channel

802.11g Modulation

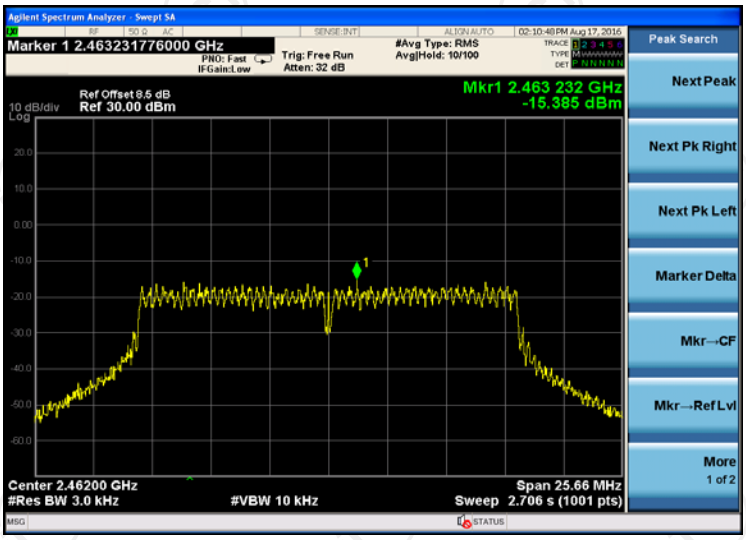
Lowest channel



Middle channel

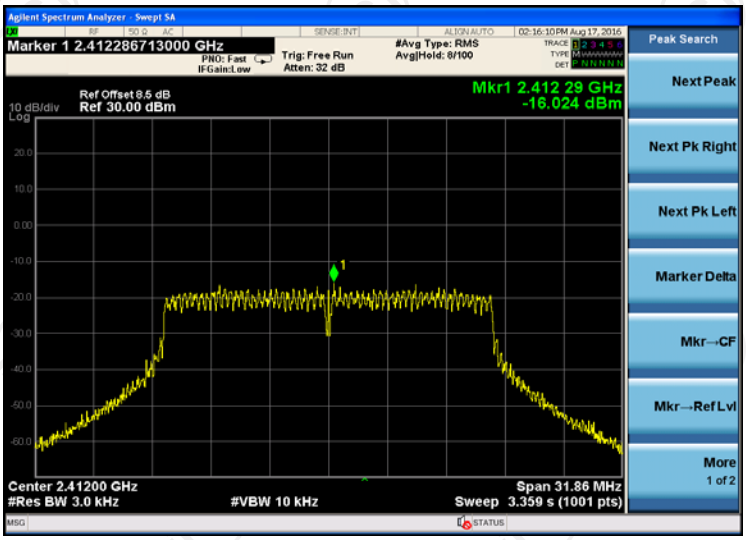


Highest channel

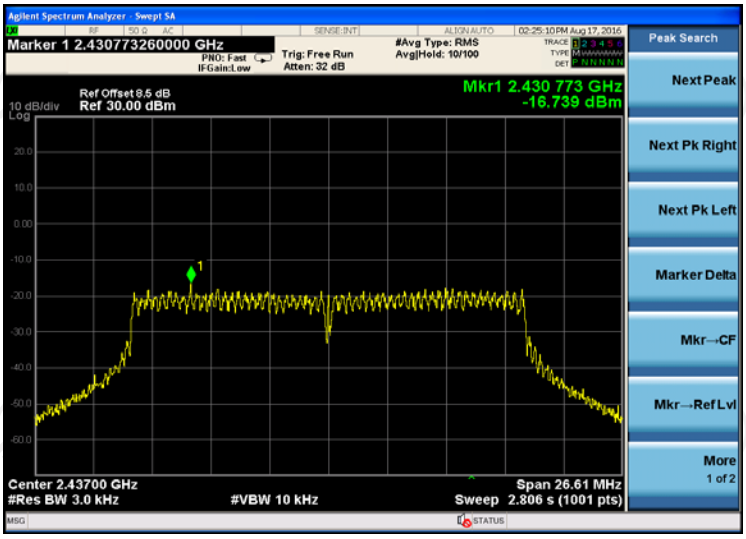


802.11n (HT20) Modulation

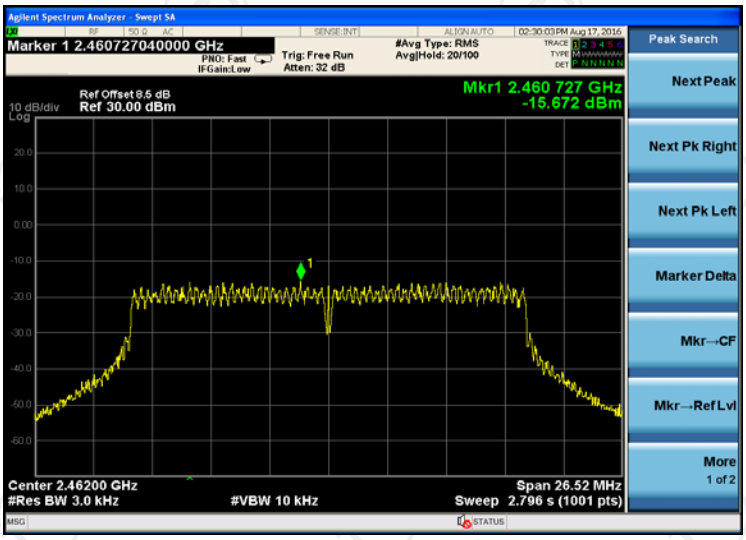
Lowest channel



Middle channel

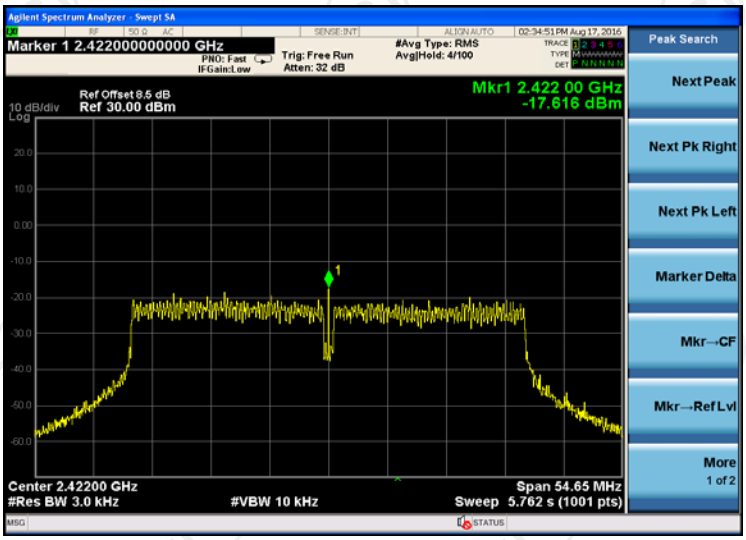


Highest channel

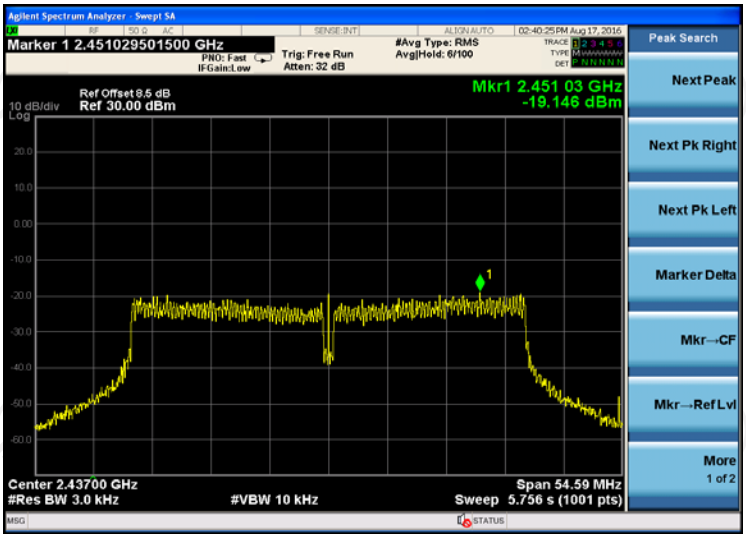


802.11n (HT40) Modulation

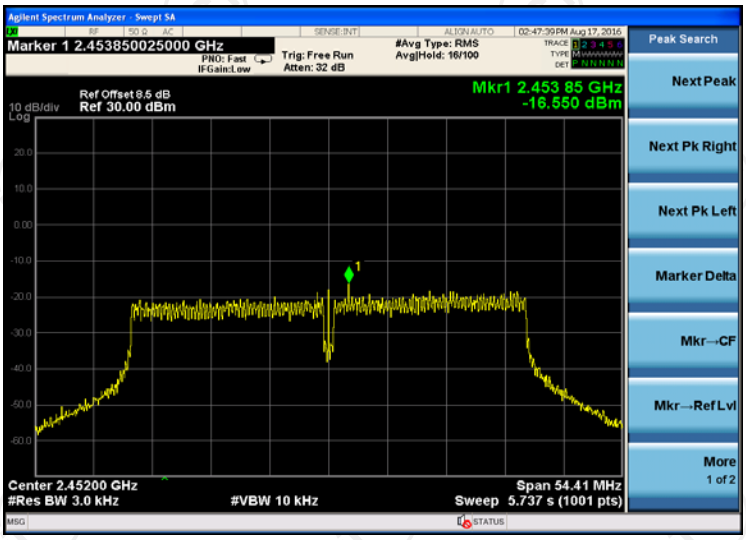
Lowest channel



Middle channel



Highest channel



Antenna 2:
802.11b Modulation

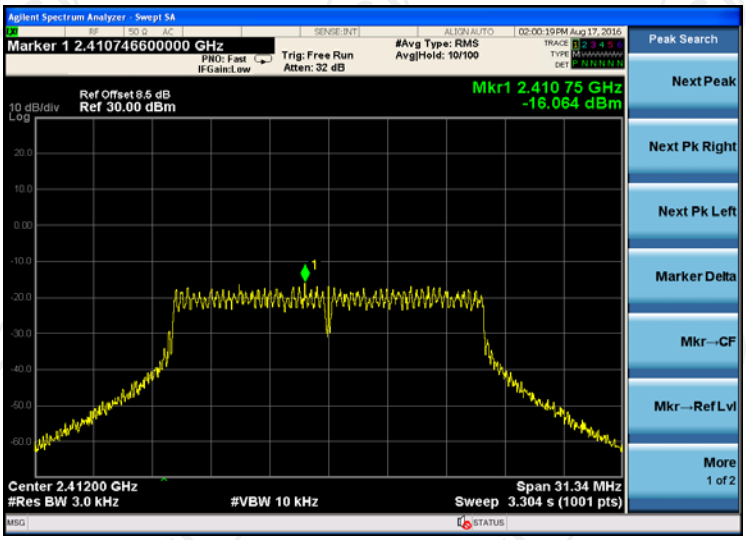
Lowest channel

Middle channel

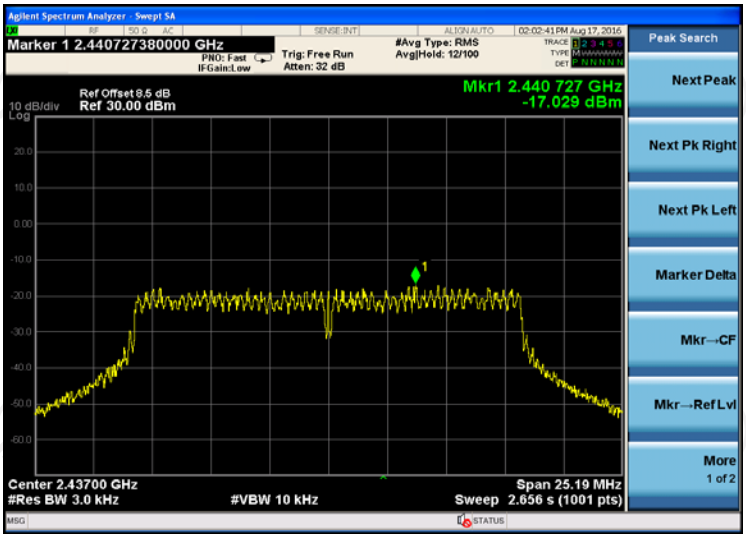
Highest channel

802.11g Modulation

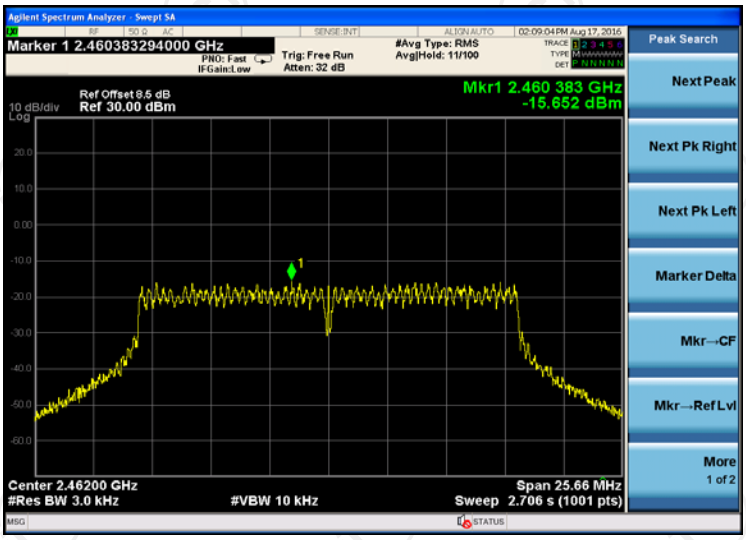
Lowest channel



Middle channel

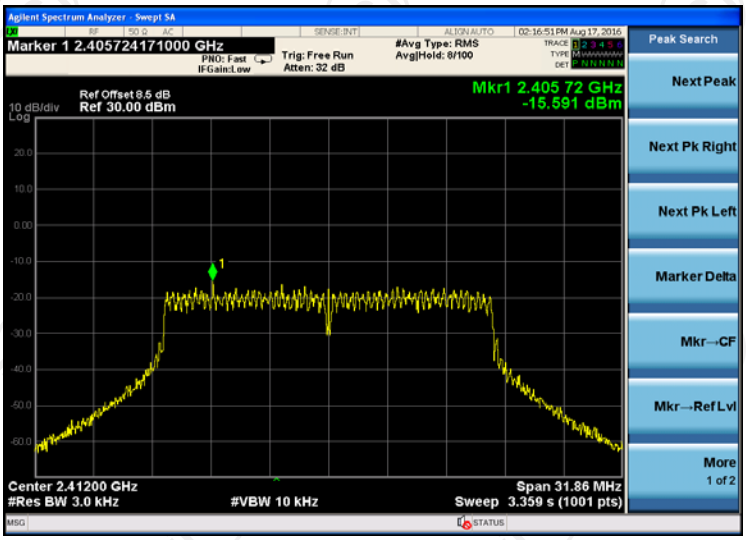


Highest channel

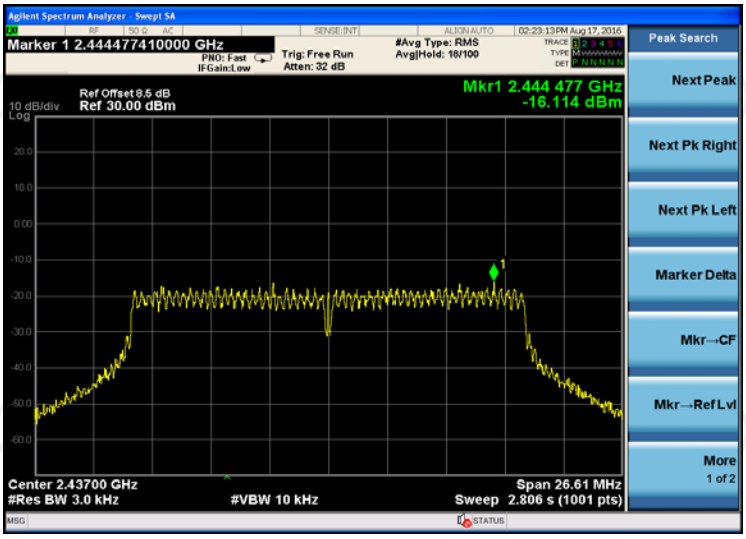


802.11n (HT20) Modulation

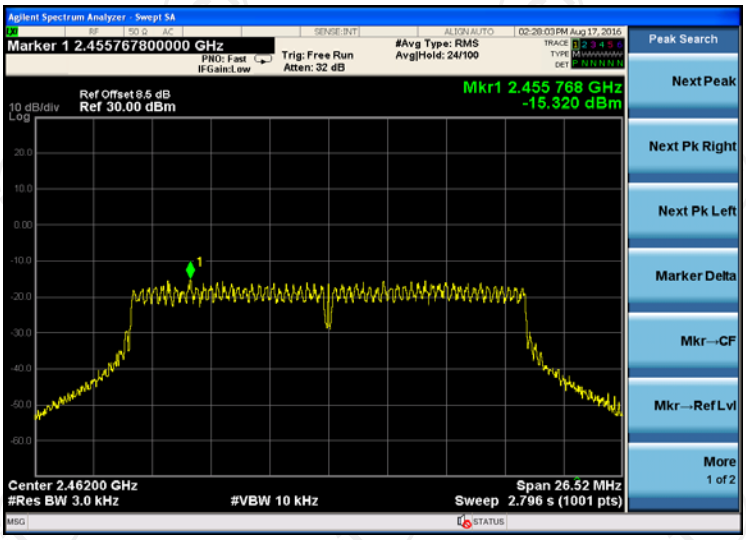
Lowest channel



Middle channel

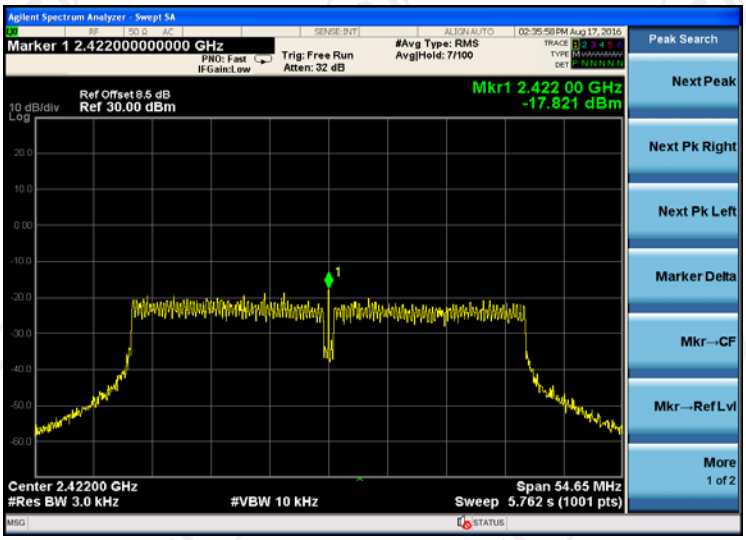


Highest channel

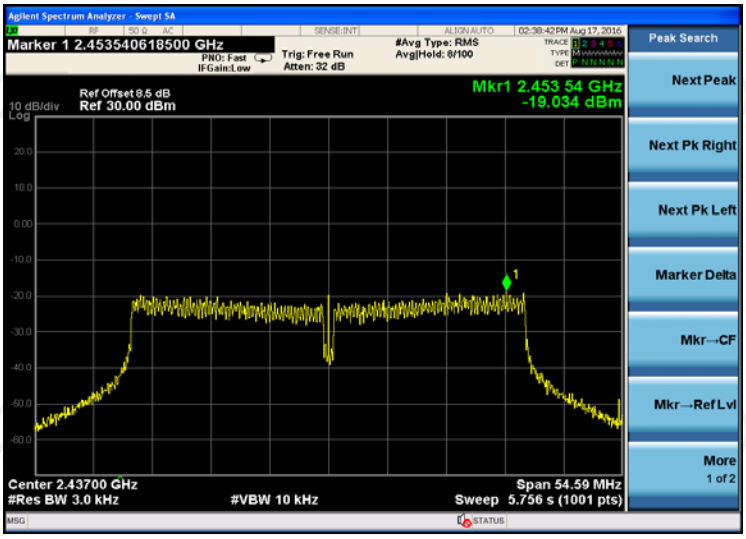


802.11n (HT40) Modulation

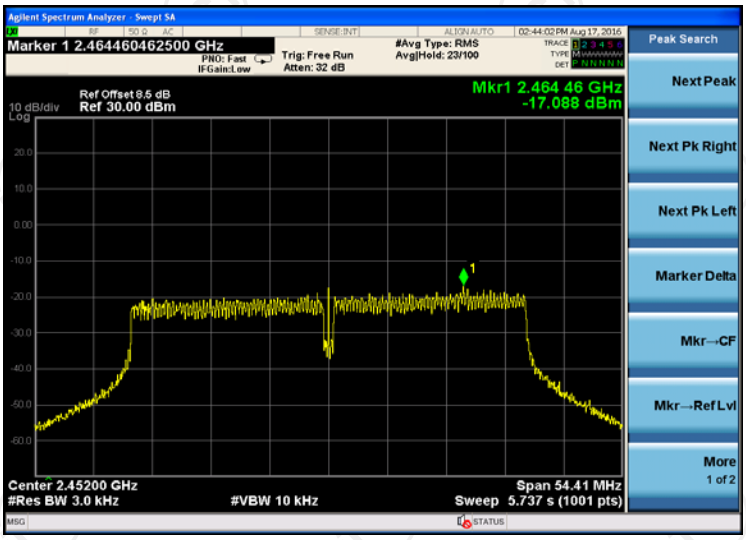
Lowest channel



Middle channel



Highest channel



6.6. Conducted Band Edge and Spurious Emission Measurement

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)/RSS-247, 5.5
Test Method:	KDB558074
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

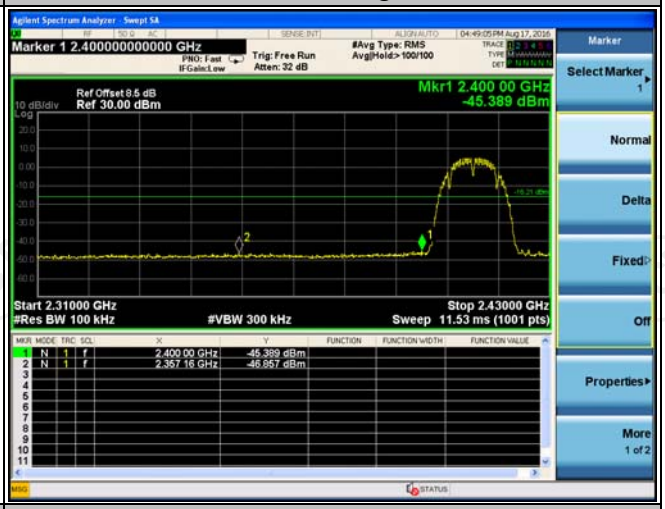
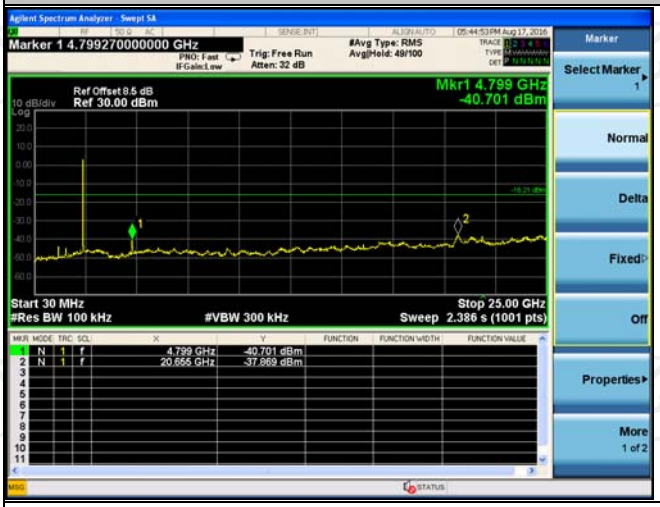
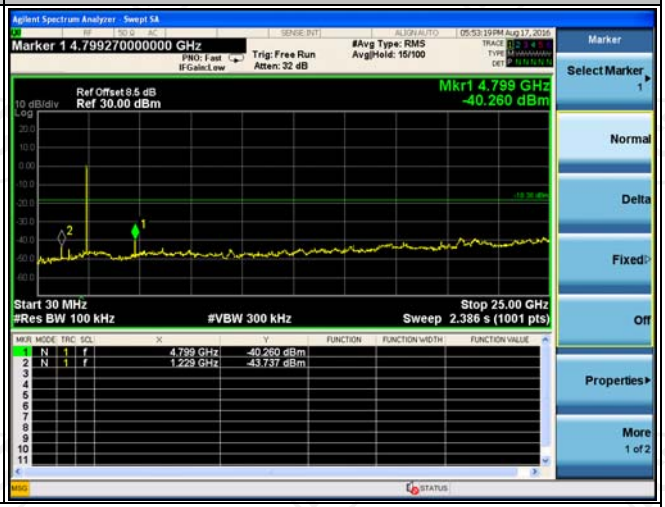
6.6.2. Test Instruments

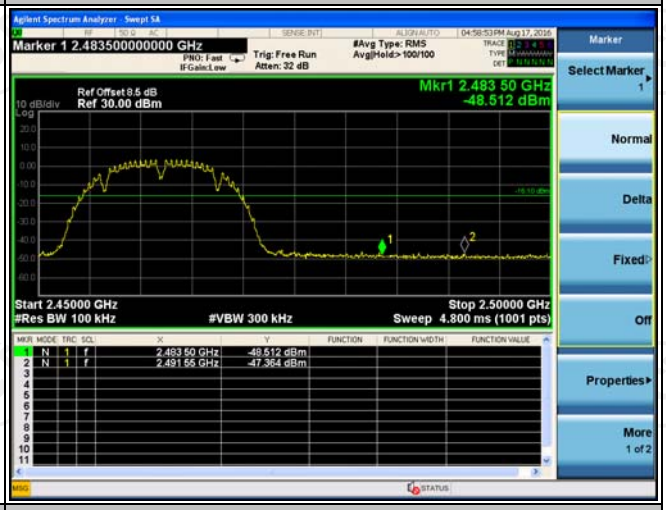
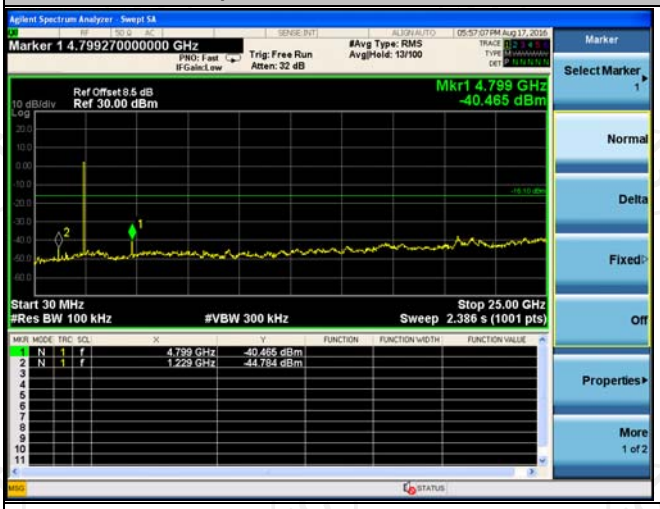
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 12, 2017
RF cable	TCT	RE-06	N/A	Aug. 12, 2017
Antenna Connector	TCT	RF-01	N/A	Aug. 12, 2017

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

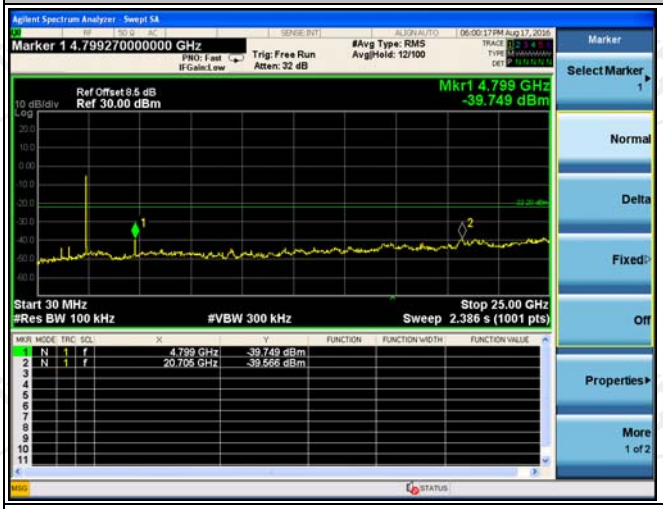
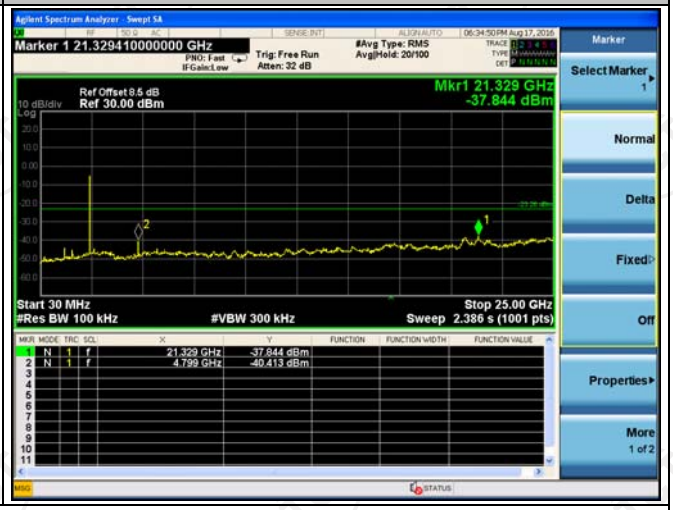
6.6.3. Test Data

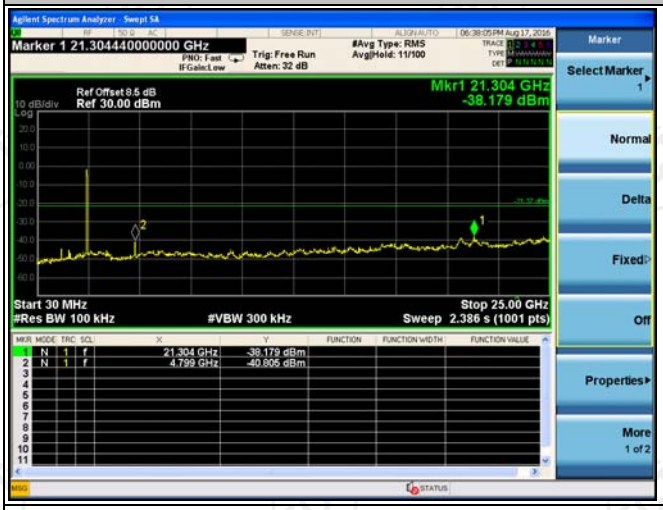
Antenna 0: 802.11b Modulation

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

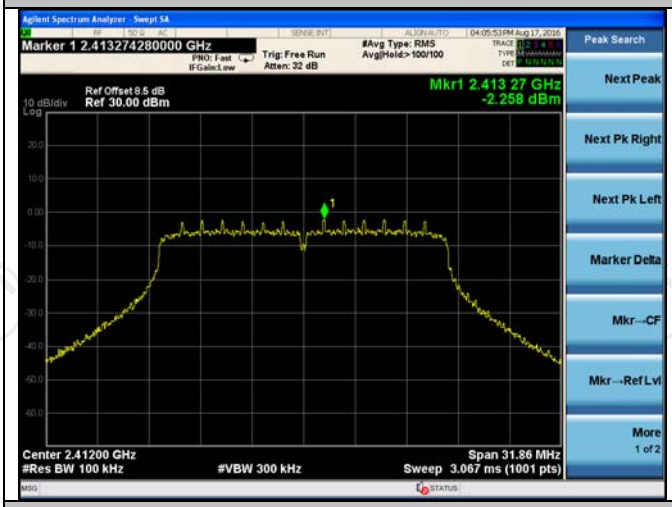
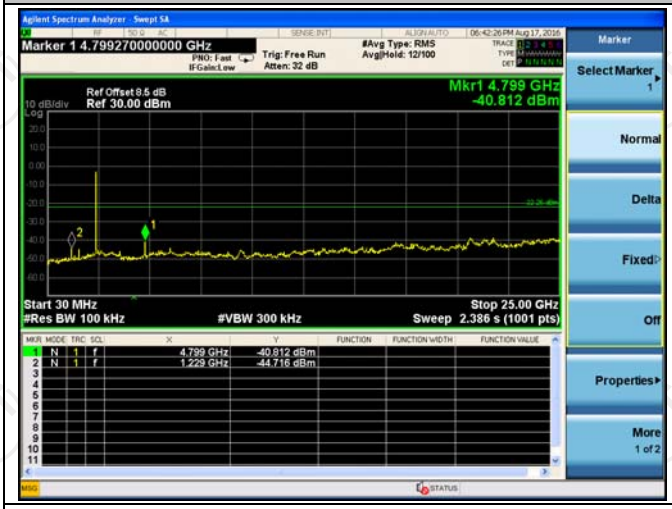
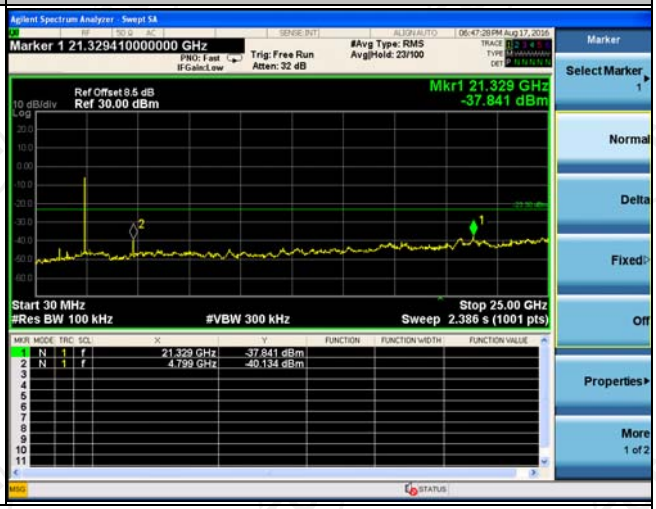
100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	

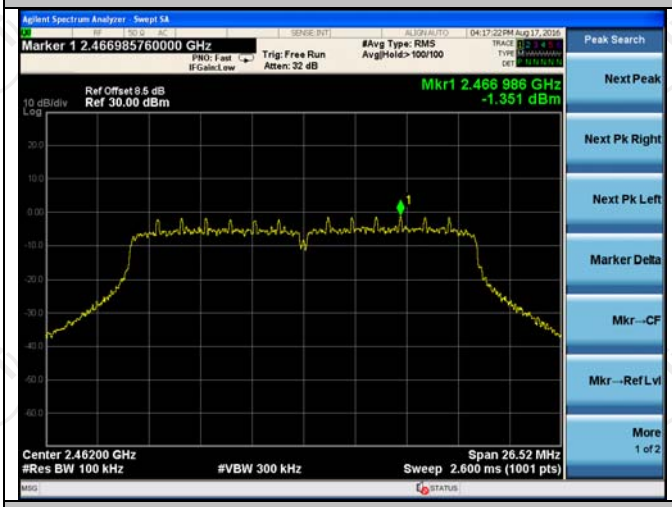
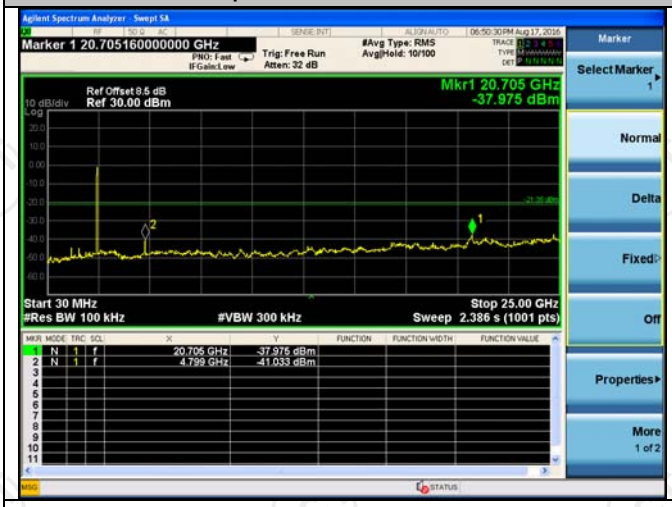
802.11g Modulation

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

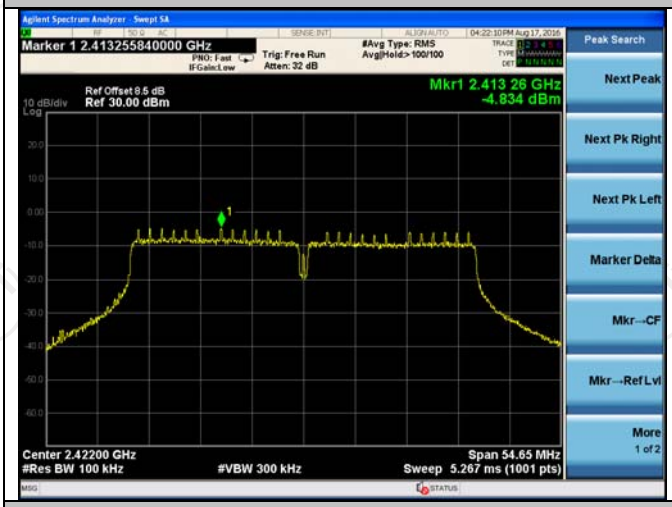
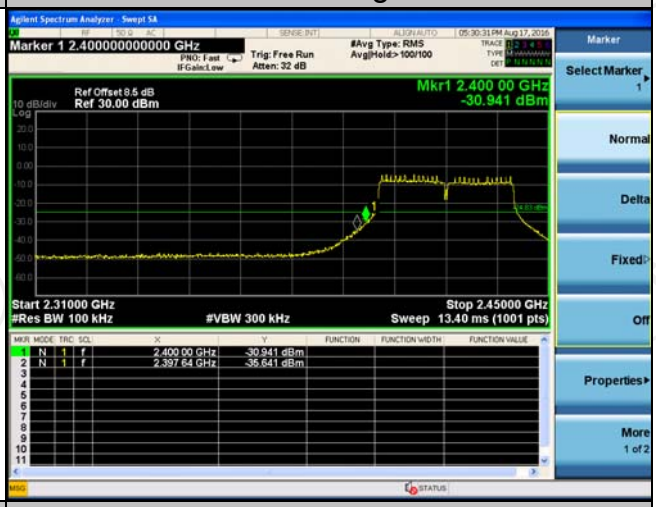
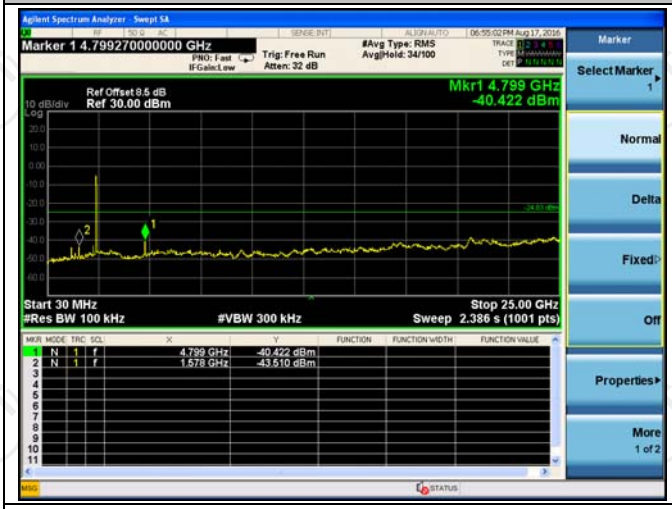
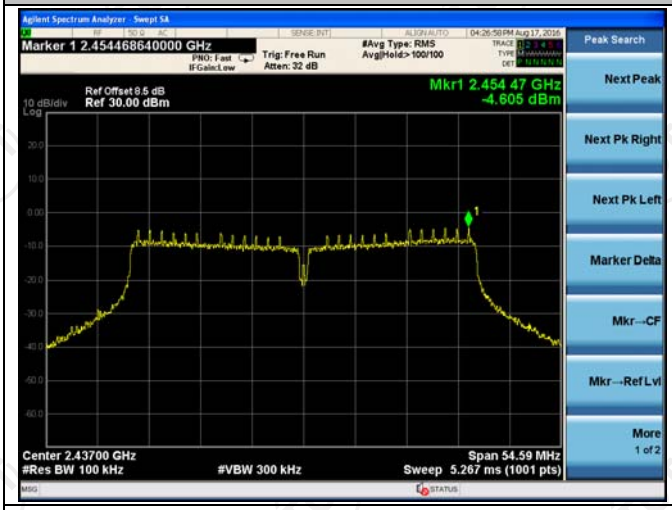
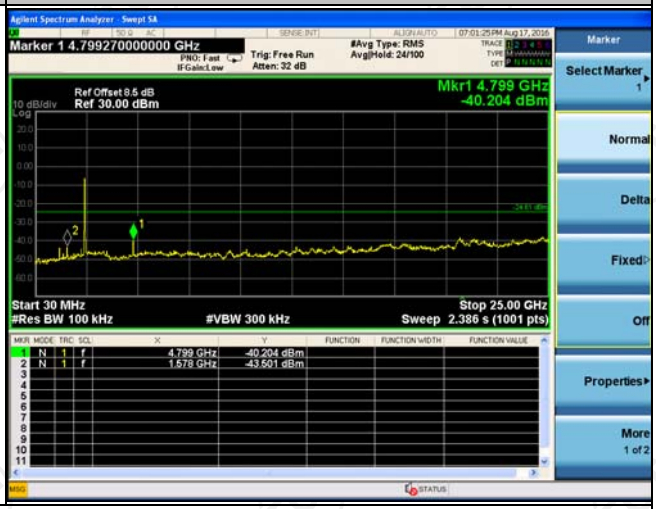
100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	

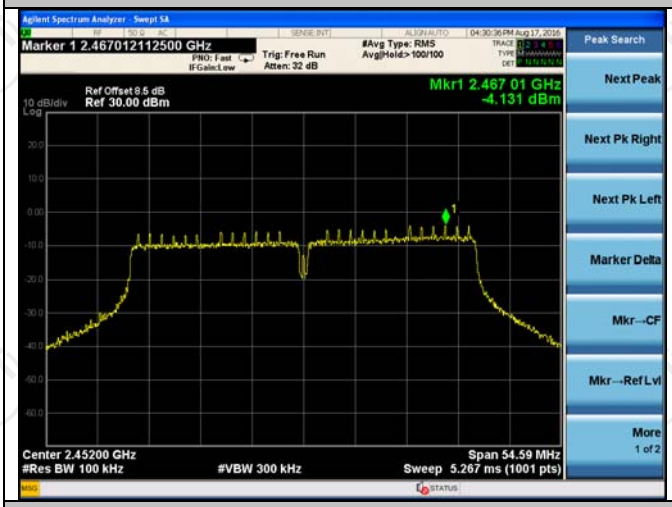
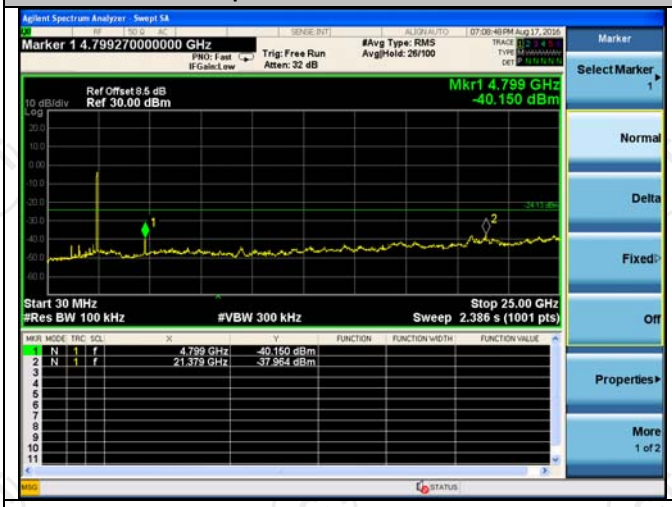
802.11n (HT20) Modulation

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	

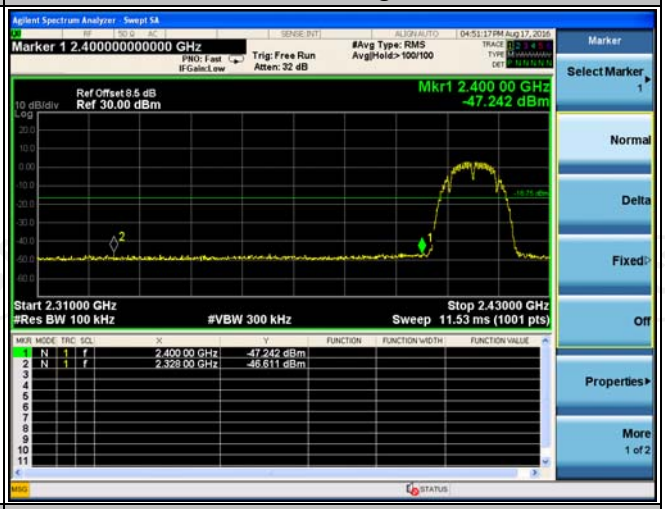
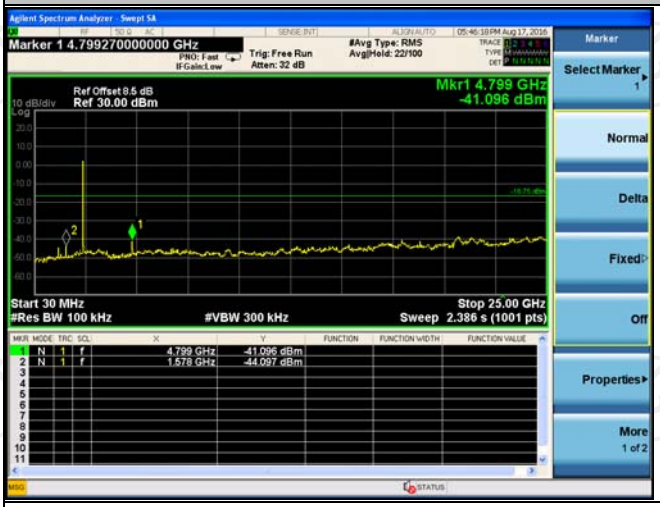
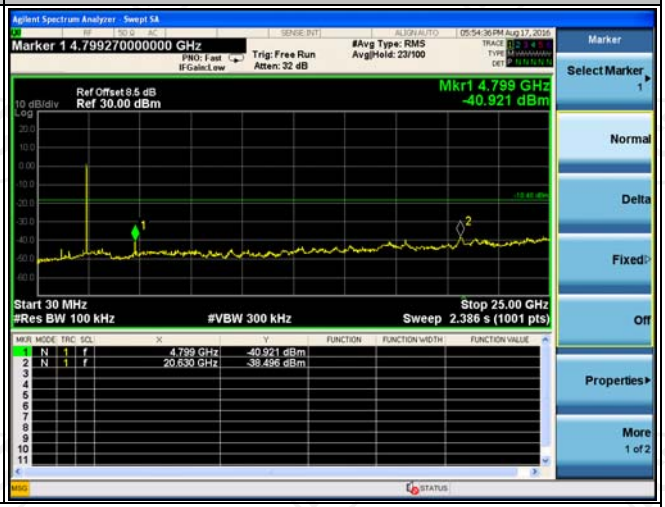
802.11n (HT40) Modulation

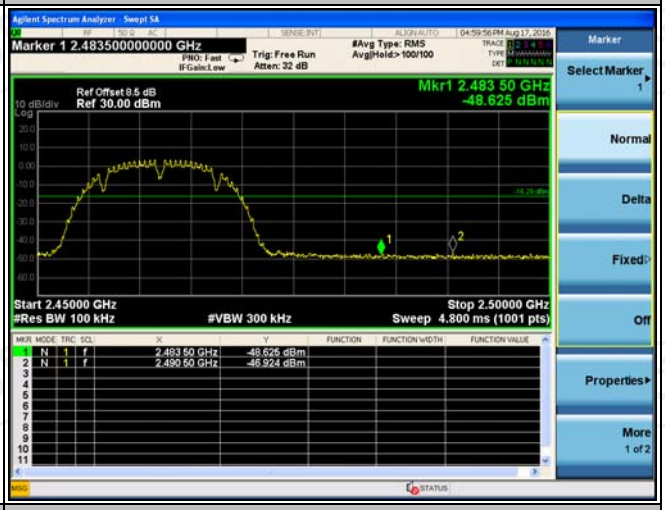
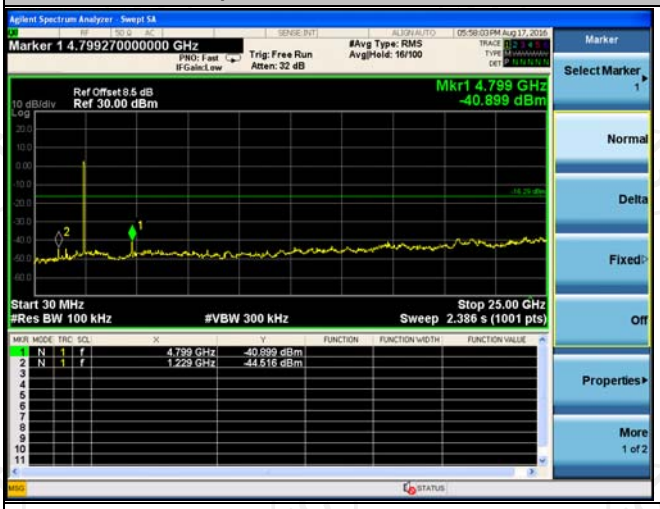
100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	

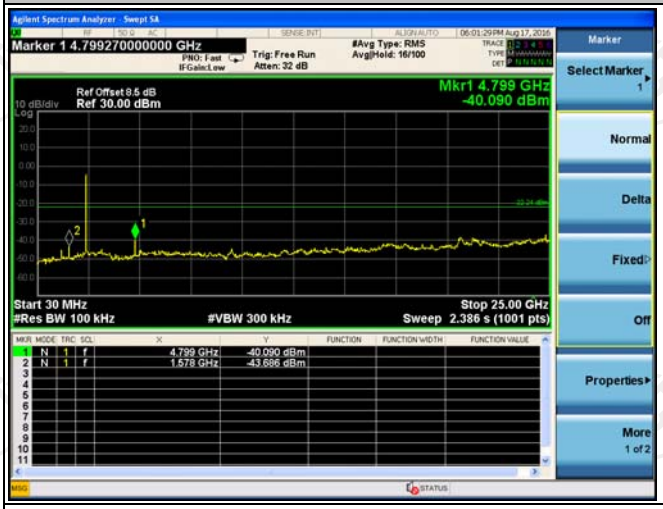
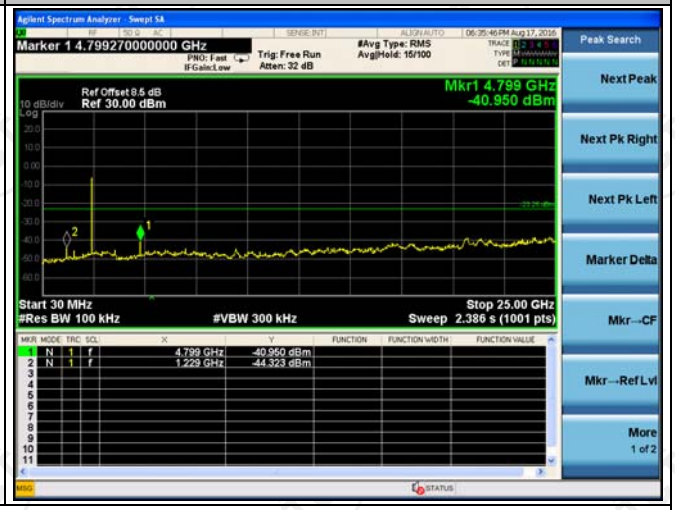
Antenna 1:

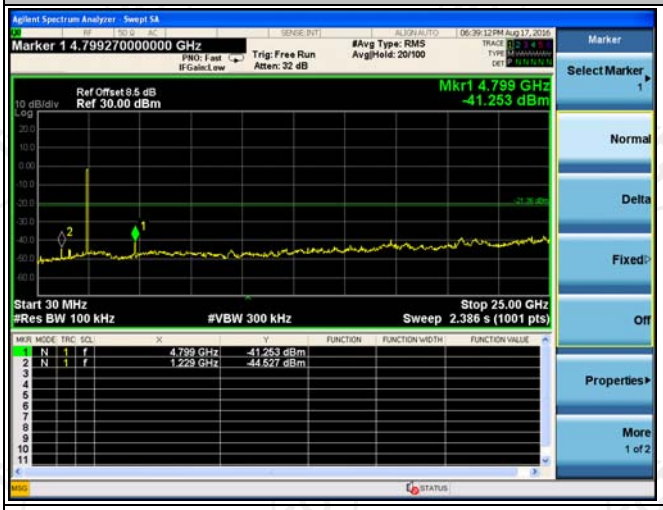
802.11b Modulation

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	

802.11g Modulation

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Lowest Channel	
100kHz PSD reference Level	**Spurious emission**
	
Middle Channel	

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	
Highest Channel	