EMC
TEST REPORT

Report No. : **150900215TWN-001**
Model No. : **K20H(K20, K20S, K20K)**
Issued Date : **Nov. 11, 2015**

Applicant: **Baycom Opto-Electronics Technology Co., Ltd.**
1F, No. 9, Industrial East 9th Rd, Hsinchu Science Park, Hsin Chu City, Taiwan

Test Method/ Standard: **47 CFR FCC Part 15.247 & ANSI C63.10 2013**
KDB 558074 D01 v03r03
KDB 662911 D01 v02r01

Registration No.: **: 93910**
Test By: **Intertek Testing Services Taiwan Ltd.**
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

The test report was prepared by: Freda Huang

Freda Huang/ Assistant

These measurements were taken by: Ricky Lee

Ricky Lee/ Engineer

The test report was reviewed by: Jimmy Yang

Name Jimmy Yang
Title Senior Engineer

Revision History

Report No.	Issue Date	Revision Summary
150900215TWN-001	Nov. 11, 2015	Original report.

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1. Summary of Test Data

Test Requirement	Applicable Rule (Section 15.247)	Result
Minimum 6 dB Bandwidth	15.247(a)(2)	Pass
Maximum Peak Conducted Output Power	15.247(b)(3)	Pass
Power Spectral Density	15.247(e)	Pass
Emissions In Non-Restricted Frequency Bands	15.247(d)	Pass
Emissions In Restricted Frequency Bands (Radiated emission measurements)	15.247(d), 15.205, 15.209	Pass
Emission On The Band Edge	15.247(d), 15.205	Pass
AC Power Line Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass

2. General Information

2.1 Identification of the EUT

Product:	WLAN IP CAM
Model No:	K20H(K20, K20S, K20K)
Brand Name:	Baycom
FCC ID:	2ACHUEK20H
Manufacturer:	QUN-DA TECHNONLOGY CO.,LTD
Address:	No. 154-2 Yuanpei Street, Hsinchu, Taiwan
Operating Frequency:	1. 2412 MHz ~ 2462 MHz for 802.11b, 802.11g, 802.11n HT20 2. 2422 MHz ~ 2452 MHz for 802.11n HT40
Channel Number:	11 channels for 2412 MHz ~ 2462 MHz 7 channels for 2422 MHz ~ 2452 MHz
Frequency of Each Channel:	2412+5 k, k＝0 ~ 10 for 802.11b, 802.11g, 802.11n HT20 2422+5 k, k＝0~6 for 802.11n HT40
Access scheme:	DSSS, OFDM
Rated Power:	DC 5 V from adapter
Power Cord:	N/A
Sample Received:	Sep. 09, 2015
Test Date(s):	Sep. 22, 2015 ~ Nov. 04, 2015
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.2 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Model no.	Specification
Adapter	AU1050507u	I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 5Vdc, 1A

2.3 Description of EUT

Modulation mode	Transmit path	
	Chain 0 / Main	Chain 1 / AUX
802.11b	V	X
802.11g	V	V
802.11 n (HT20)	V	V
802.11 n (HT40)	V	V

Product SW version : 1.4.10.27.C
Product HW version : ES5
Radio SW version : NA
Radio HW version : ES4

2.4 Antenna description

The EUT uses a permanently connected antenna

Antenna Gain : 2 dBi
Antenna Type : PCB Antenna
Connector Type : I-PEX

2.5 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	IBM	1860	L3BTAG6	RJ-45 STP Cat.5 1 meter × 1
Wireless AP	BUFFALO	WZR-AGL300NH	44000000000000	RJ-45 STP Cat.5 1 meter × 1

2.6 Operation mode

The EUT was supplied with DC 5 V from adapter (Test voltage: 120 Vac, 60 Hz) .
TX-MODE is based on a specific test program "MT7620QA.exe", and the program can select different frequency and modulation.

With individual verifying, the maximum output power were found out 1 Mbps data rate for 802.11b mode, 6 Mbps data rate for 802.11g mode, 6.5 Mbps data rate for 802.11n(HT20) mode and 13.5 Mbps data rate for 802.11n(HT40) mode, the final tests were executed under these conditions recorded in this report individually.

The final tests were executed under these conditions recorded in this report individually.

802.11b ch6 chain0		**802.11g ch6 chain0**		**802.11g ch6 chain1**	
Data rate (Mbps)	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**
1	13.5	6	14.34	6	14.68
2	13.46	9	14.25	9	14.61
5.5	13.44	12	14.22	12	14.54
11	13.28	18	14.2	18	14.52
		24	11.48	24	11.91
		36	11.47	36	11.87
		48	9.62	48	10.13
		54	9.55	54	10.01

802.11n HT20 ch6 chain0		802.11n HT20 ch6 chain1	
Data rate (Mbps)	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**
MCS0	13.43	MCS0	14.2
MCS1	13.36	MCS1	14.18
MCS2	13.22	MCS2	14.08
MCS3	13.17	MCS3	14.07
MCS4	11.29	MCS4	11.97
MCS5	11.24	MCS5	11.95
MCS6	8.62	MCS6	10.11
MCS7	8.81	MCS7	9.66

802.11n HT40 ch6 chain0		802.11n HT40 ch6 chain1	
Data rate	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**
MCS0	13.07	MCS0	13.62
MCS1	13.06	MCS1	13.6
MCS2	13.01	MCS2	13.53
MCS3	12.92	MCS3	13.48
MCS4	9.62	MCS4	10.09
MCS5	8.13	MCS5	10.19
MCS6	6.01	MCS6	8.58
MCS7	6.02	MCS7	8.21

2.7 Applied test modes and channels

Test items	Mode	Data Rate (Mbps)	Channel	Antenna
Minimum 6 dB Bandwidth	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0/Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0/Chain1
Maximum peak conducted output power	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0/Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0/Chain1
Power Spectral Density	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0/Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0/Chain1
RF Antenna Conducted Spurious	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0/Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0/Chain1
Radiated spurious Emission 9kHz~1GHz	Normal Link			
Radiated Spurious Emission 10GHz~10th Harmonic	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0+Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0+Chain1
Emission on the Band Edge	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0/Chain1
	802.11 n (HT20)	6.5	1, 6, 11	Chain0+Chain1
	802.11 n (HT40)	13	3, 6, 9	Chain0+Chain1
AC Power Line Conducted Emission	Normal Link			

2.8 Power setting of test software

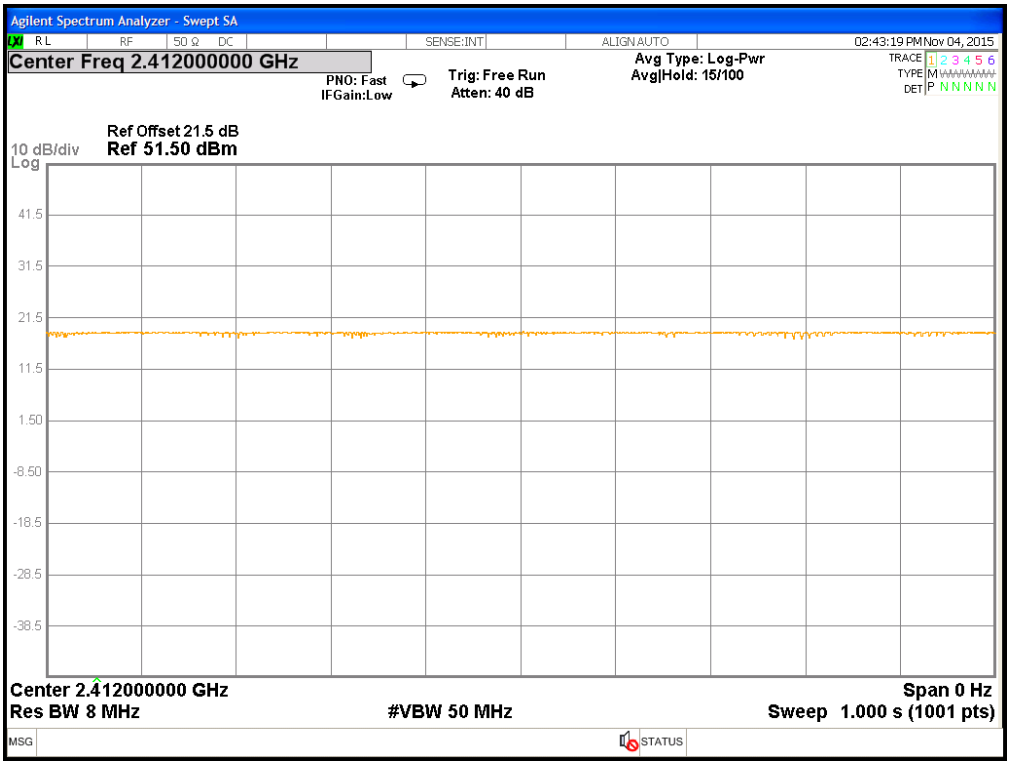
Channels & power setting software provided by the client was used to change the operating channels as well as the output power level and is going to be installed in the final end product.

Mode	Software Version: MT7620 QA V1.0.6.0		
	Channel	Frequency(MHz)	Power setting
802.11b (chain0)	1	2412	default
	6	2437	default
	11	2462	default
802.11g (chain0 / 1)	1	2412	default
	6	2437	default
	11	2462	default
802.11n (HT20)	1	2412	default
	6	2437	default
	11	2462	default
802.11n (HT40)	3	2422	default
	6	2437	default
	9	2452	default

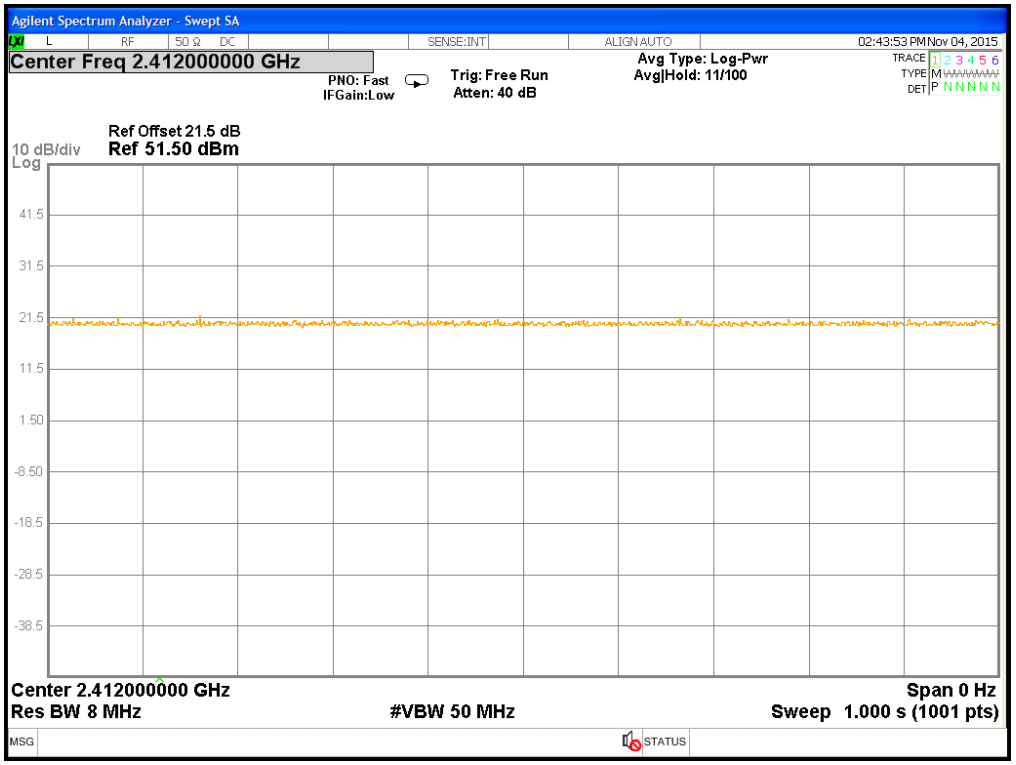
Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

Mode	Channel	Frequency (MHz)	Data rate	Signal on time(ms)	Total signal transmit time(ms)	Duty cycle	Duty Cycle factor
802.11b	6	2412	1	1.001	1.001	1.000	0.000
802.11g	6	2412	6	1.001	1.001	1.000	0.000
802.11n HT20	6	2412	6.5	1.001	1.001	1.000	0.000
802.11n HT40	6	2422	13	1.001	1.001	1.000	0.000

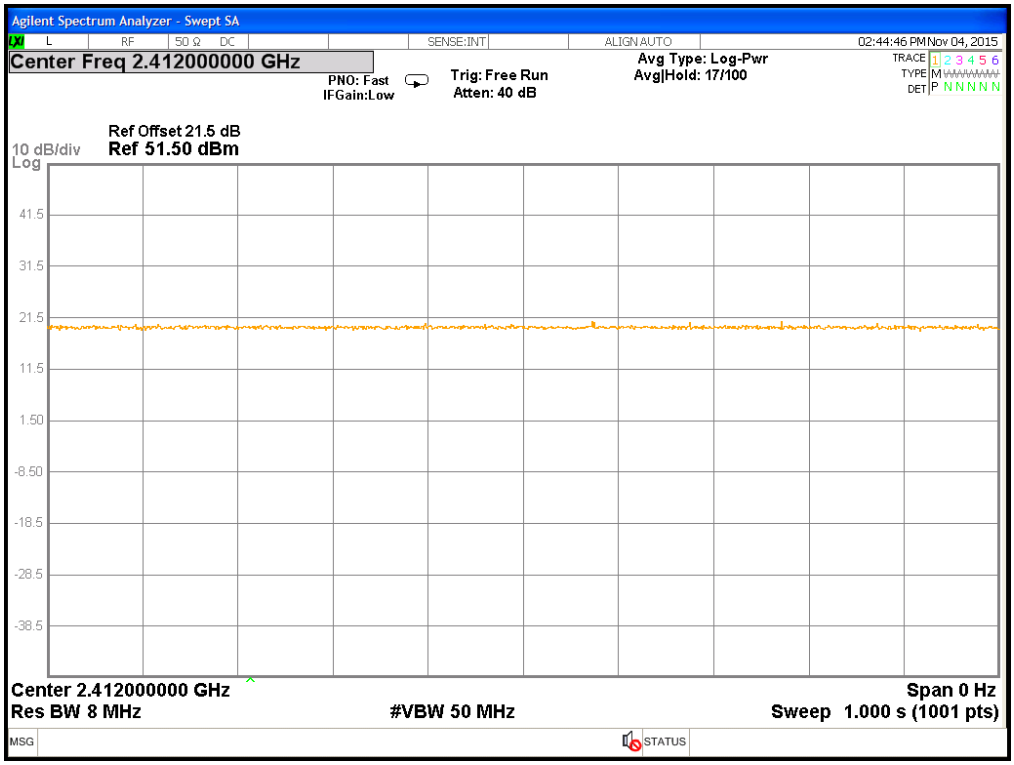
Duty Cycle @ 802.11b mode Ch 6



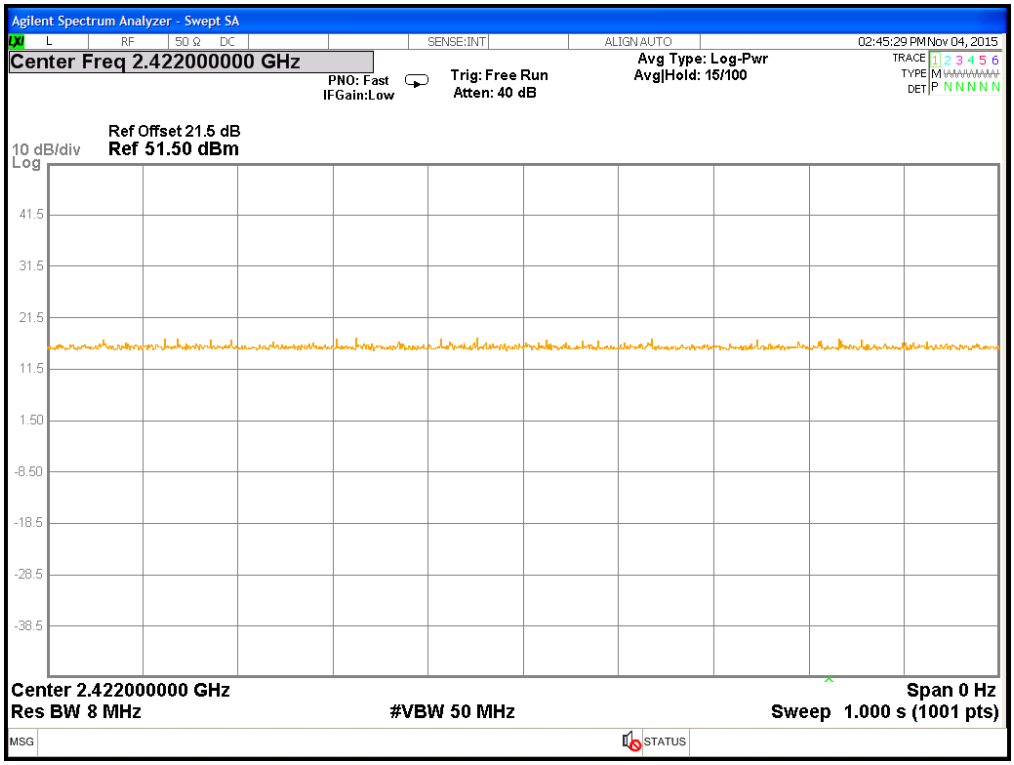
Duty Cycle @ 802.11g mode Ch 6



Duty Cycle @ 802.11n(HT20) mode Ch 6



Duty Cycle @ 802.11n(HT40) mode Ch 6



3. Minimum 6 dB Bandwidth

3.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	15.247(a)(2) KDB 558074 D01 v03r03	

3.2 Limit for minimum 6dB bandwidth

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

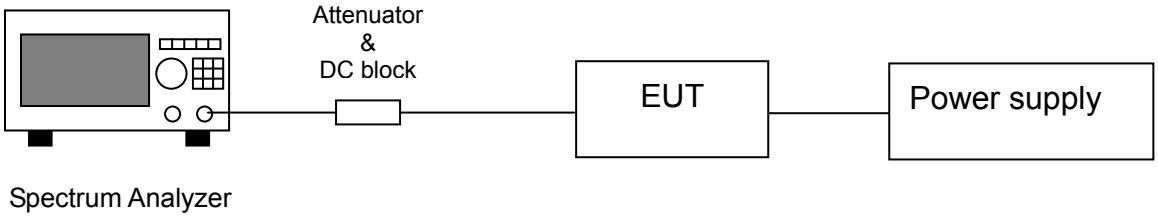
3.3 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	100kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	Between two times and five times the occupied bandwidth
Attenuation	Auto

3.4 Test procedure

1. The transmitter output was connected to the spectrum analyzer.
2. Test was performed in accordance with clause 8.1 option1 of KDB 558074 D01
3. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

3.5 Test diagram



3.6 Test results

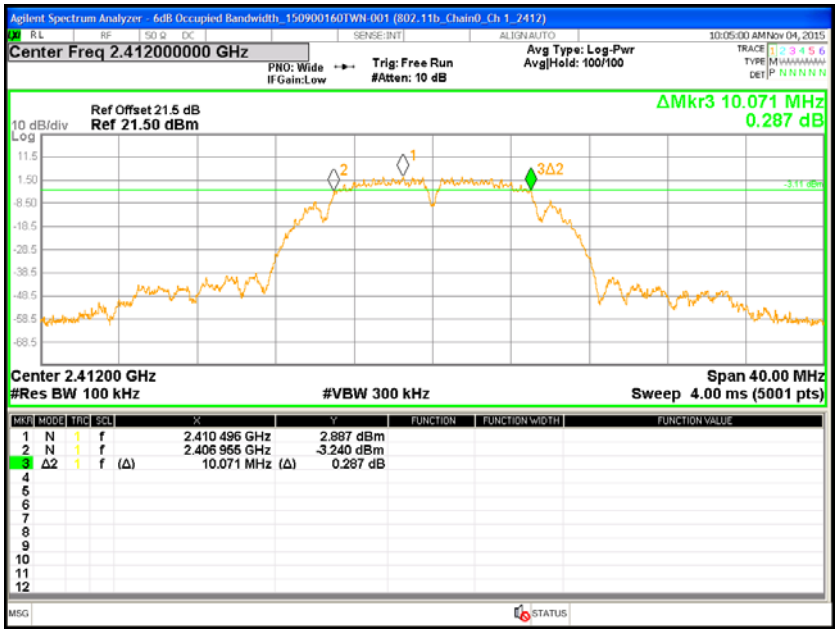
Single TX

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
802.11b (chain0)	1	2412	10.071	0.5	Pass
	6	2437	10.072	0.5	Pass
	11	2462	10.067	0.5	Pass
802.11g (chain0)	1	2412	16.340	0.5	Pass
	6	2437	16.342	0.5	Pass
	11	2462	16.414	0.5	Pass
802.11g (chain1)	1	2412	16.349	0.5	Pass
	6	2437	16.364	0.5	Pass
	11	2462	16.372	0.5	Pass

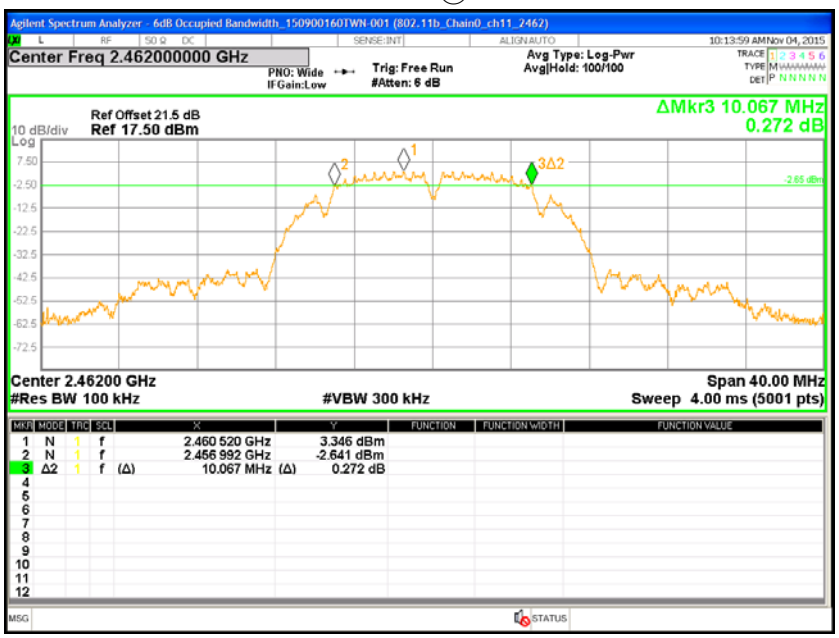
2TX

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Limit (MHz)	Pass/Fail
			chain0	chain1		
802.11n (HT20)	1	2412	17.058	17.068	0.5	Pass
	6	2437	17.268	17.545	0.5	Pass
	11	2462	17.521	17.299	0.5	Pass
802.11n (HT40)	3	2422	36.308	36.042	0.5	Pass
	6	2437	36.328	36.056	0.5	Pass
	9	2452	36.314	36.134	0.5	Pass

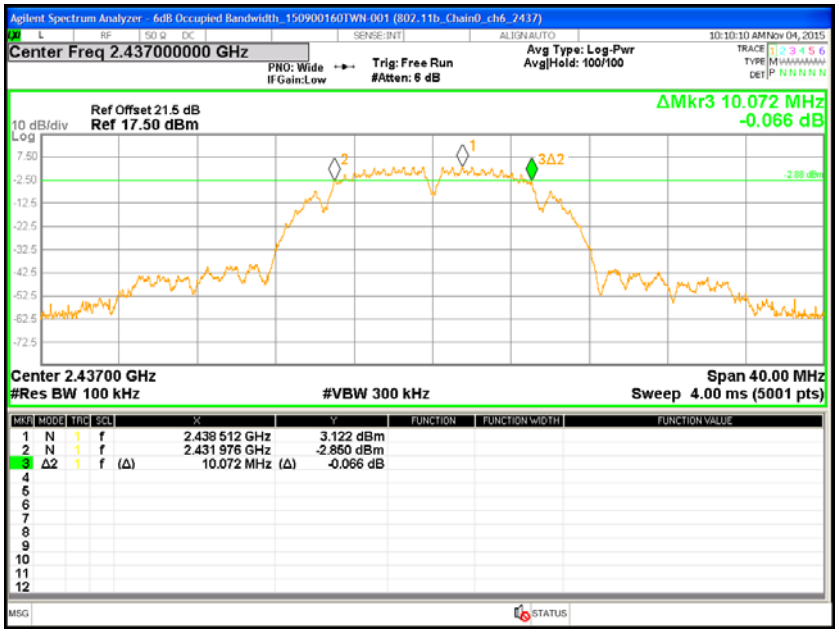
Chain0 : 6dB Bandwidth @ 802.11b mode Ch 1



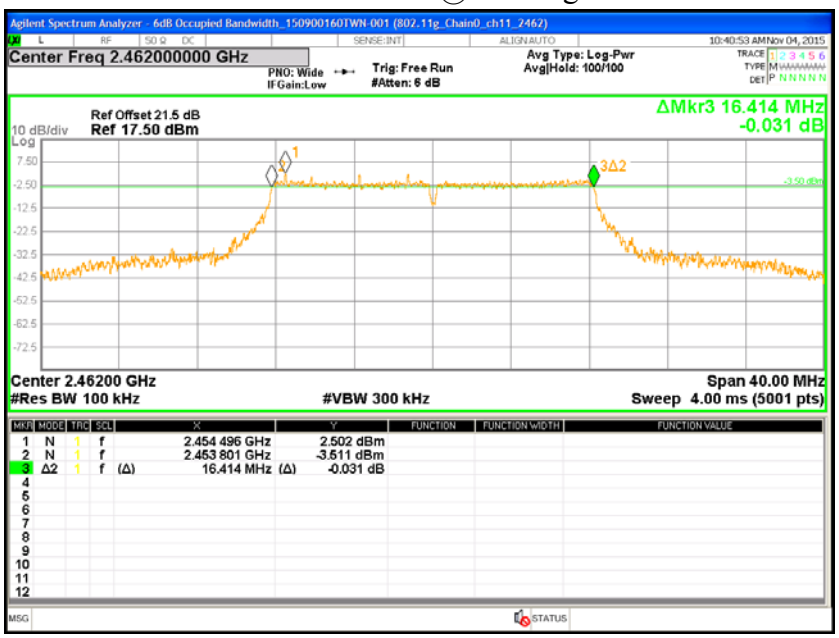
Chain0 : 6dB Bandwidth @ 802.11b mode ch11



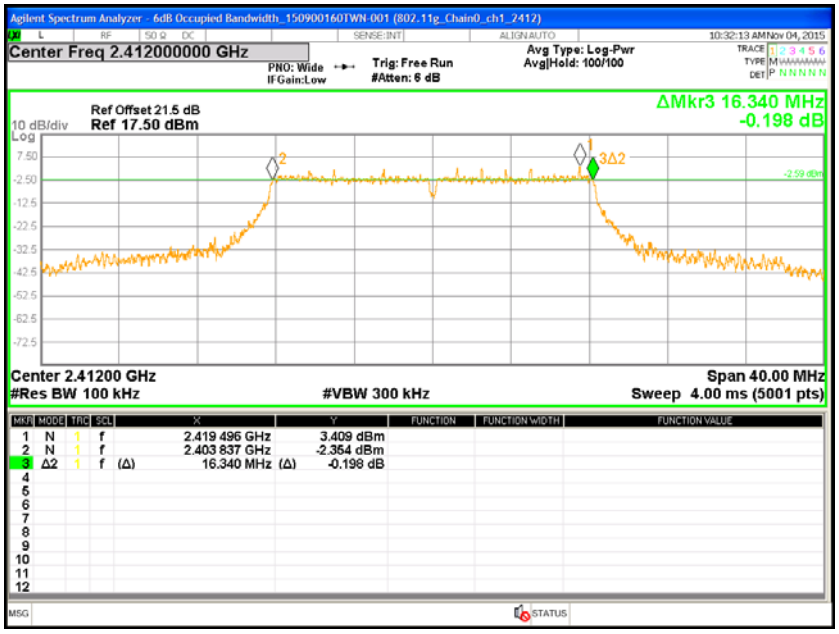
Chain0 : 6dB Bandwidth @ 802.11b mode ch6



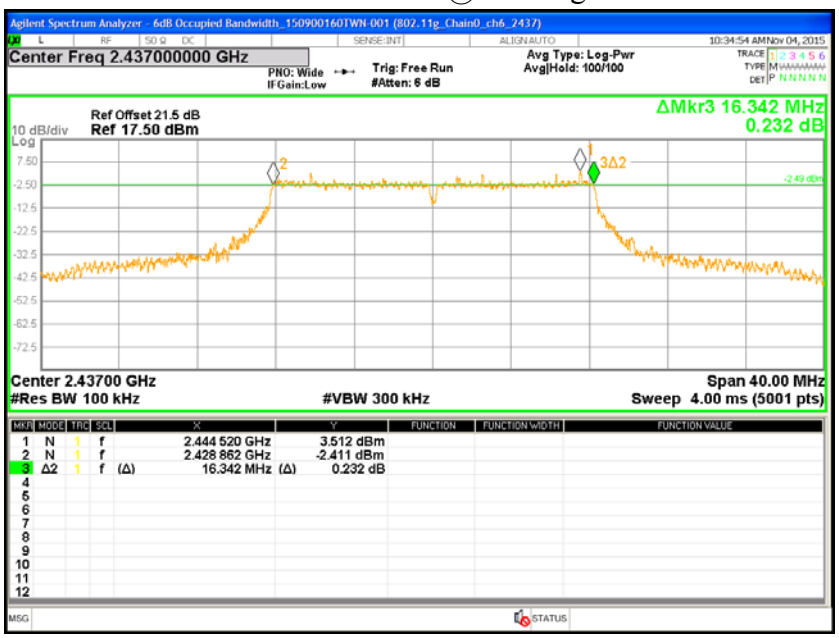
Chain0 : 6dB Bandwidth @ 802.11g mode ch11



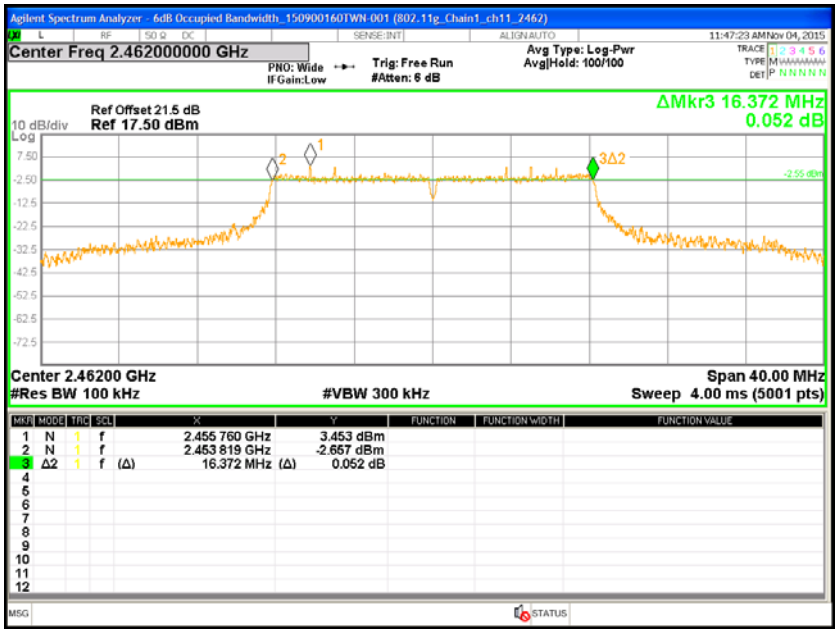
Chain0 : 6dB Bandwidth @ 802.11g mode ch1



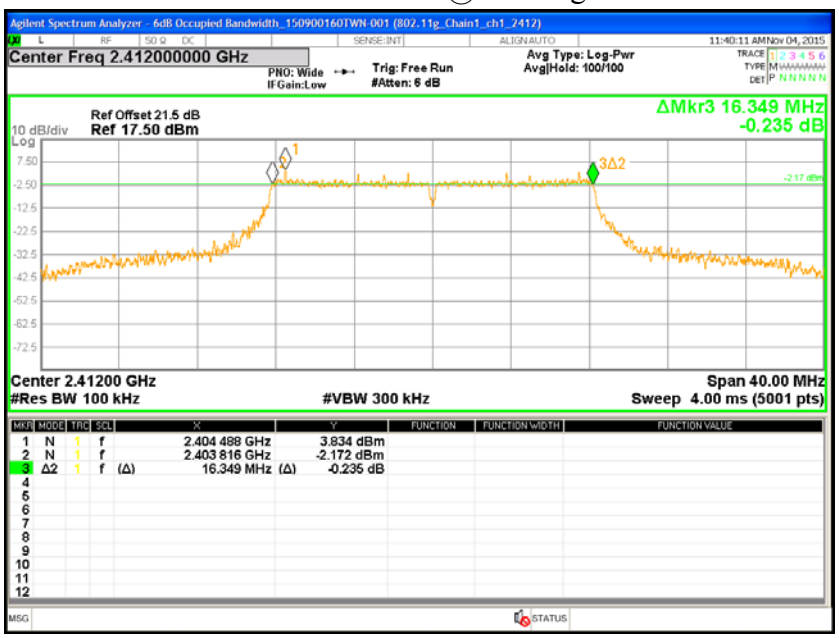
Chain0 : 6dB Bandwidth @ 802.11g mode ch6



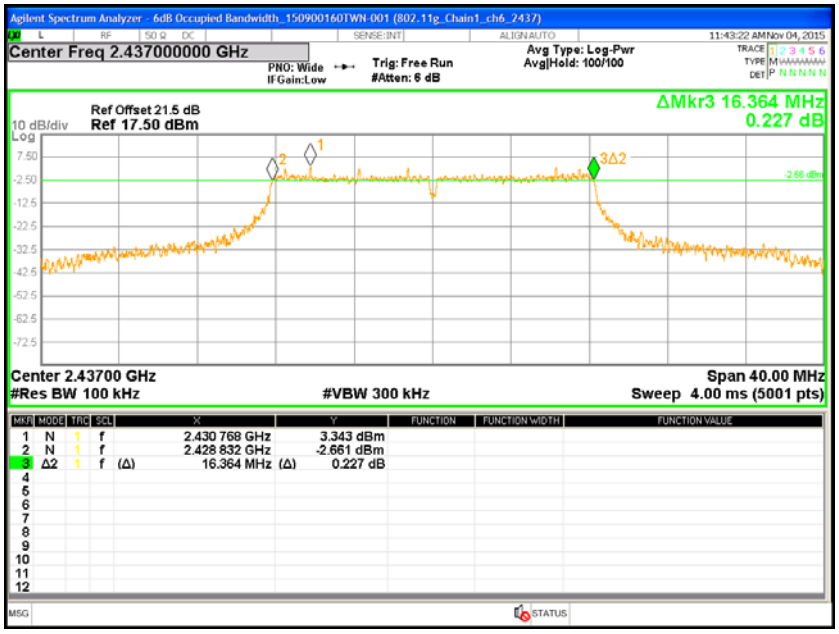
Chain1 : 6dB Bandwidth @ 802.11g mode ch11



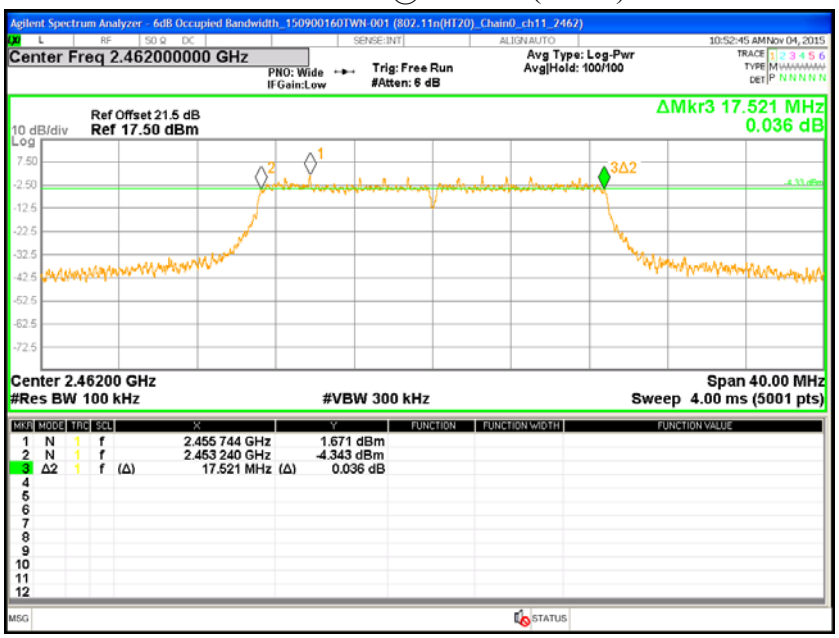
Chain1 : 6dB Bandwidth @ 802.11g mode ch1



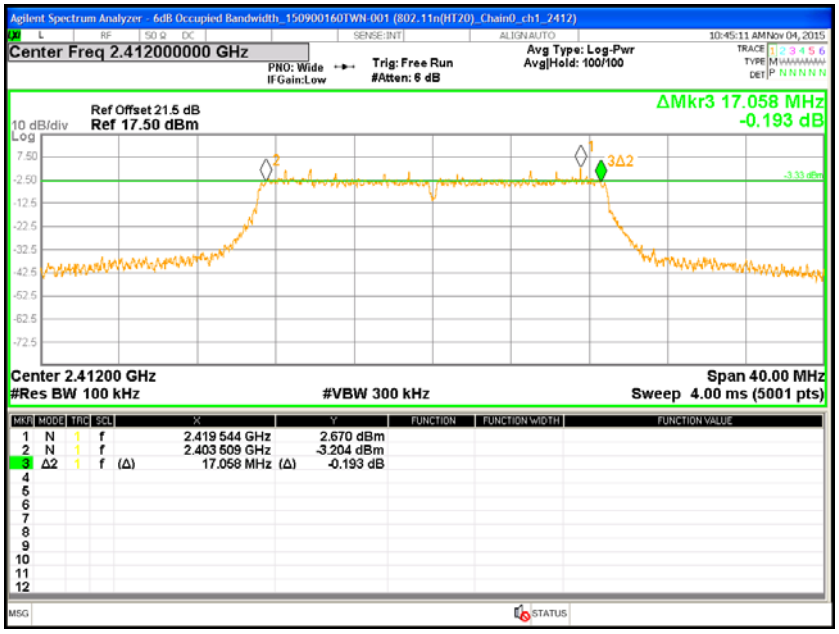
Chain1 : 6dB Bandwidth @ 802.11g mode ch6



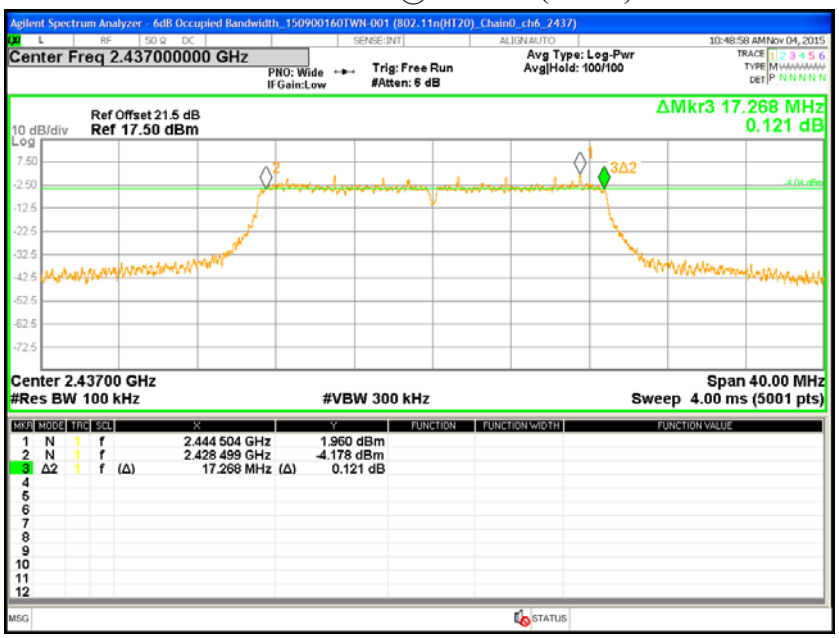
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch11



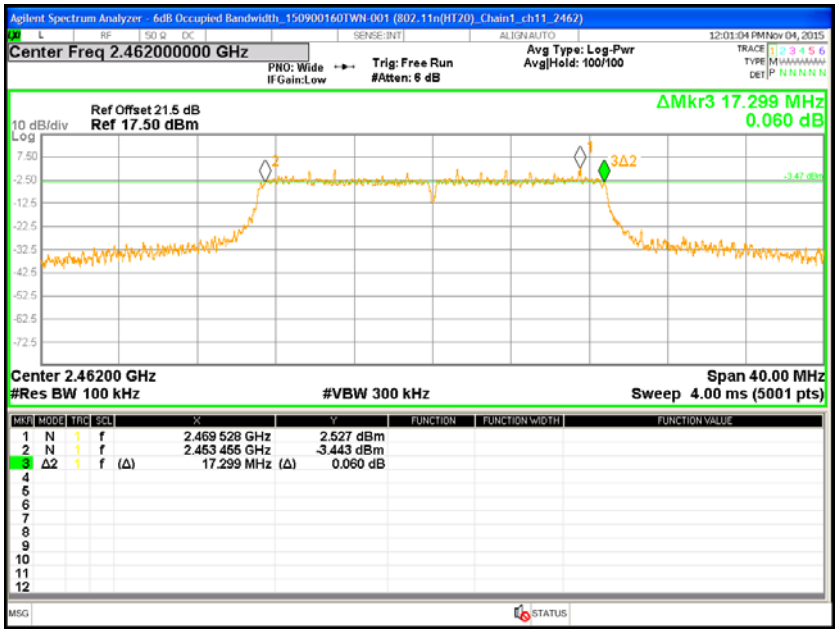
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch1



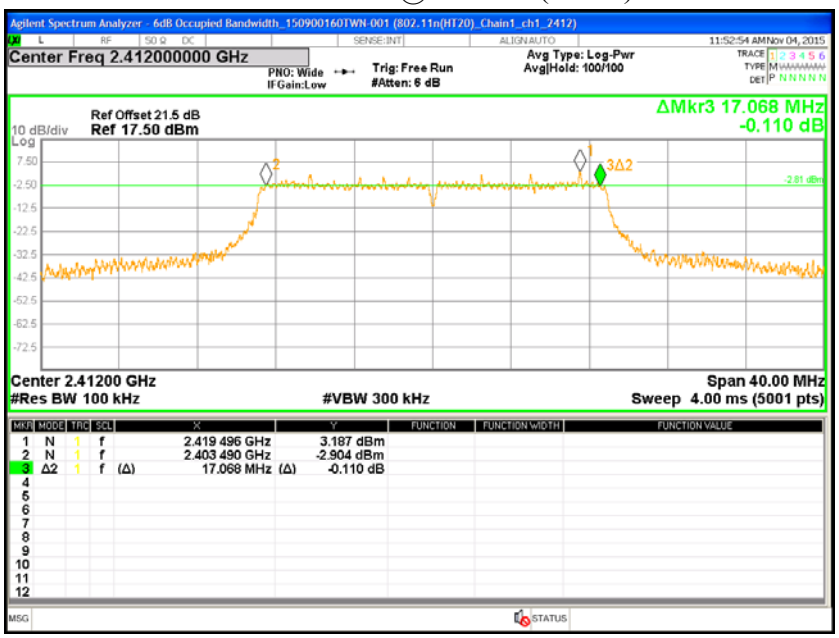
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch6



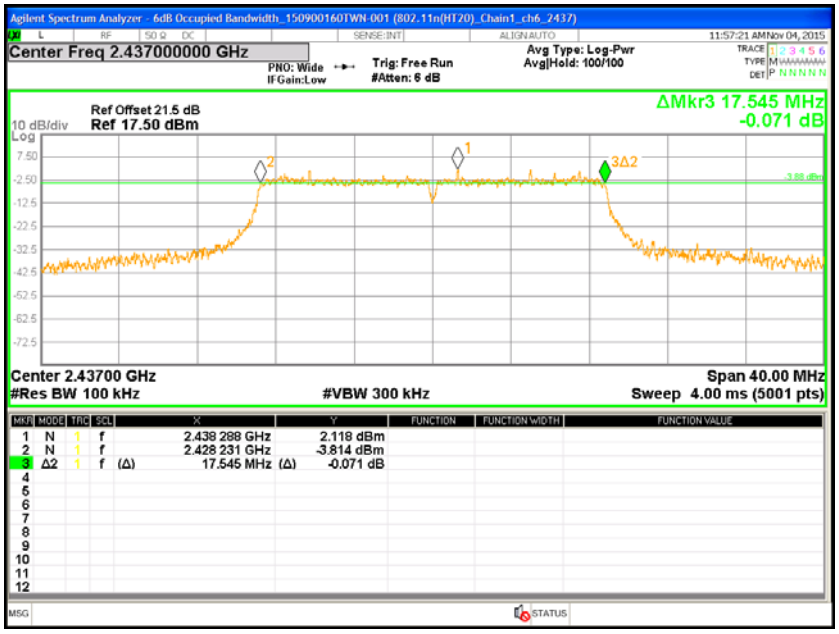
Chain1 : 6dB Bandwidth @ 802.11n(HT20) mode ch11



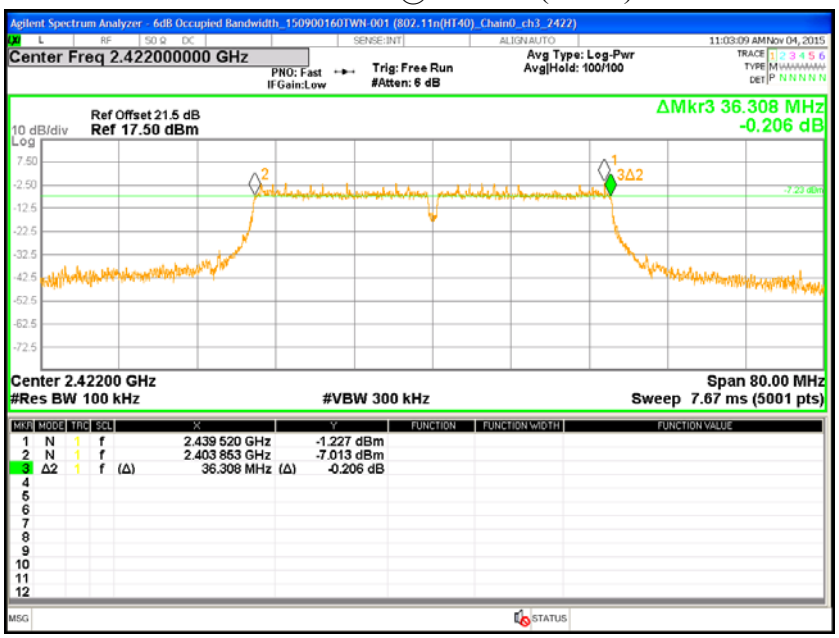
Chain1 : 6dB Bandwidth @ 802.11n(HT20) mode ch1



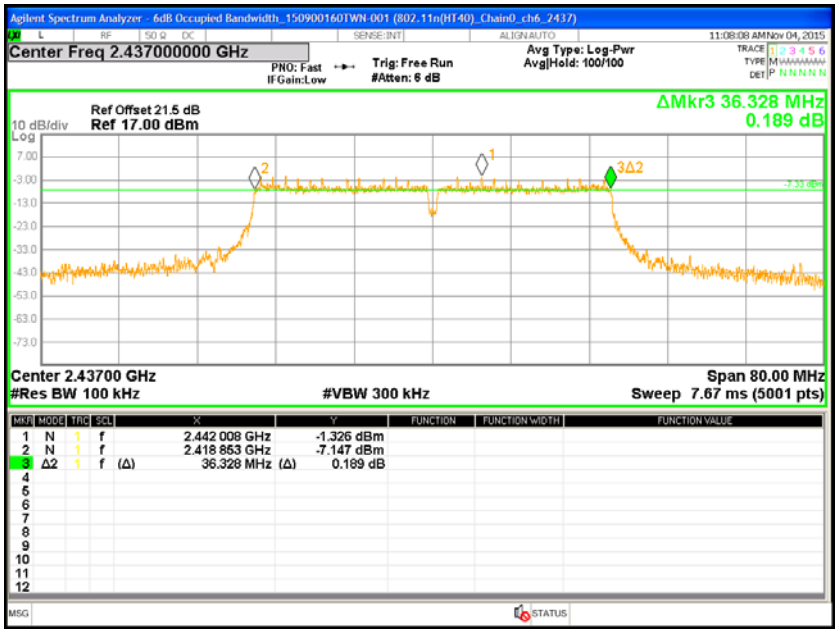
Chain1 : 6dB Bandwidth @ 802.11n(HT20) mode ch6



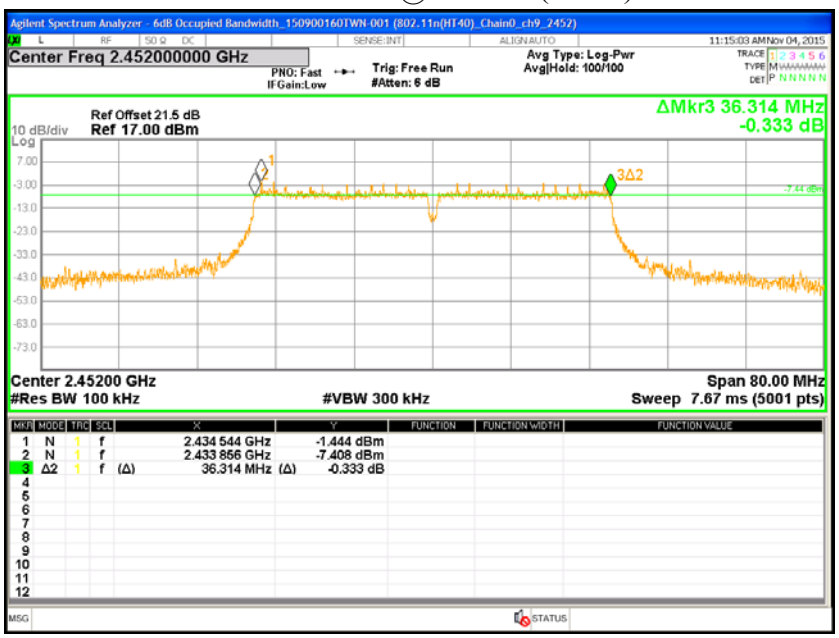
Chain0 : 6dB Bandwidth @ 802.11n(HT40) mode ch3



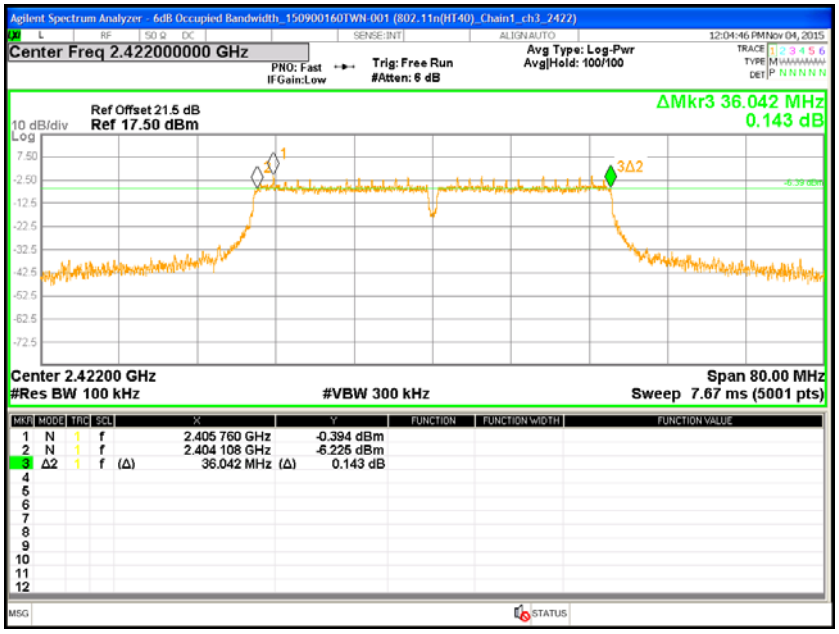
Chain0 : 6dB Bandwidth @ 802.11n(HT40) mode ch6



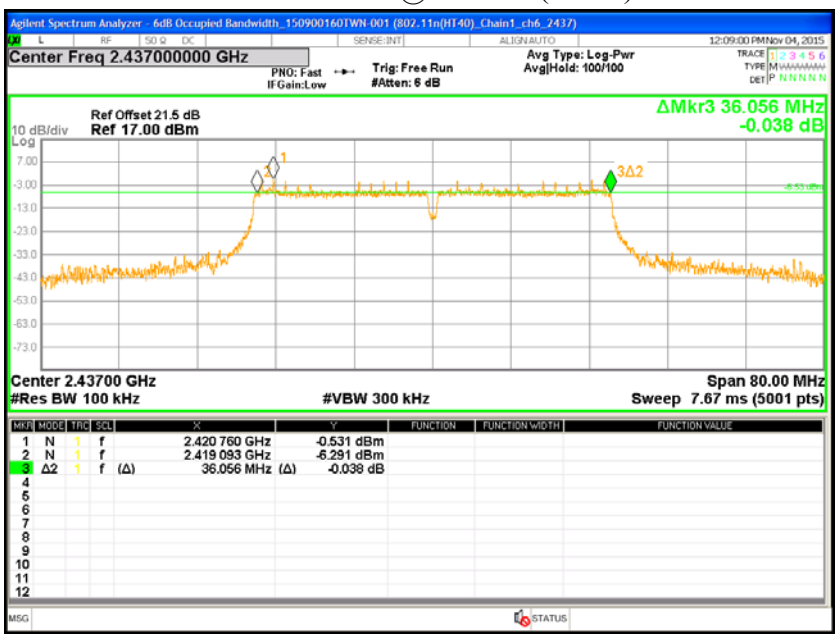
Chain0 : 6dB Bandwidth @ 802.11n(HT40) mode ch9



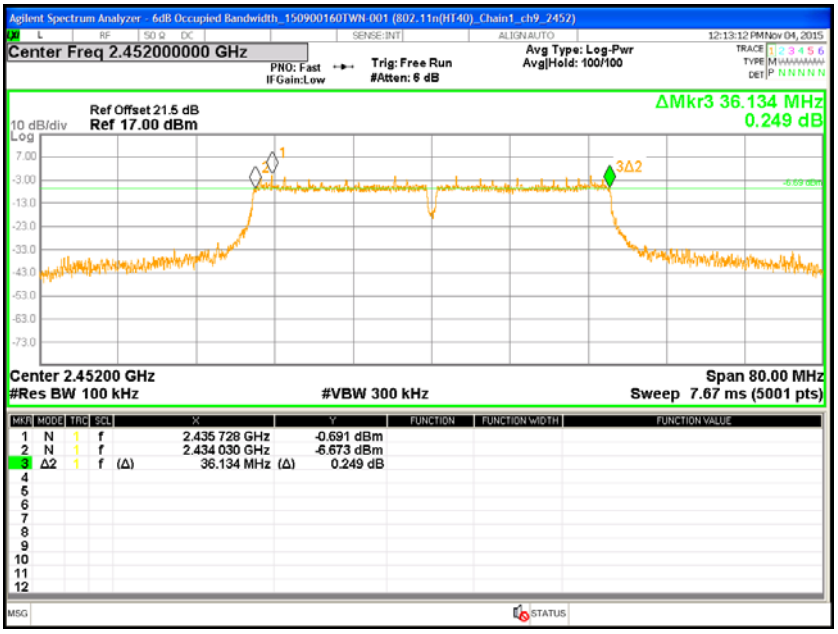
Chain1 : 6dB Bandwidth @ 802.11n(HT40) mode ch3



Chain1 : 6dB Bandwidth @ 802.11n(HT40) mode ch6



Chain1 : 6dB Bandwidth @ 802.11n(HT40) mode ch9



4. Maximum Peak Conducted Output Power

4.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	15.247(b)(3) KDB 558074 D01 v03r03	

4.2 Limit for maximum peak conducted output power

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt (30dBm)

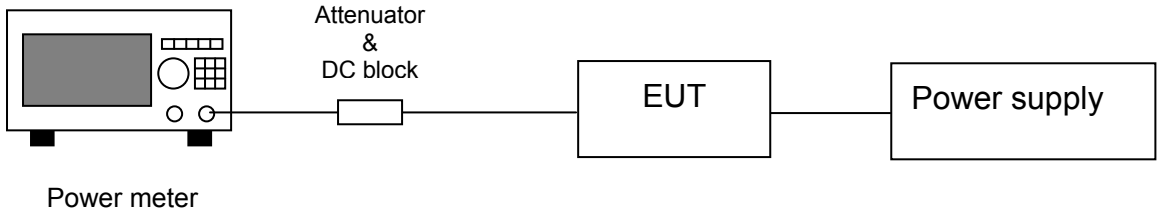
4.3 Measuring instrument setting

Power meter	
Power meter	**Setting**
Bandwidth	65MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak & Average

4.4 Test procedure

Test procedures refer to clause 9.1.2 peak power meter method and clause 9.2.3.2 measurement using a gated RF average power meter of KDB 558074 D01.

4.5 Test diagram



4.6 Test result

Single TX

Mode	Channel	Frequency (MHz)	Data Rate (Mbps)	Output Power (AV) (dBm)	Total Power (AV) (mW)	Maximun power (PK) (dBm)	Maximun power (PK) (mW)	Limit (dBm)	Margin (dB)
802.11b (chain0)	1	2412	1	13.28	21.28	16.64	46.1318	30	-13.36
	6	2437		13.39	21.83	16.75	47.3151	30	-13.25
	11	2462		13.38	21.78	16.71	46.8813	30	-13.29
802.11g (chain0)	1	2412	6	14.15	26.00	21.84	152.757	30	-8.16
	6	2437		14.2	26.30	21.9	154.882	30	-8.10
	11	2462		14.13	25.88	21.81	151.705	30	-8.19
802.11g (chain1)	1	2412	6	14.52	28.31	22.35	171.791	30	-7.65
	6	2437		14.54	28.44	21.41	138.357	30	-8.59
	11	2462		14.38	27.42	20.81	120.504	30	-9.19

2TX

Mode	Ch.	Freq. (MHz)	Data Rate (Mbps)	Output Power (dBm)				Output Power (mW)				Total Power (dBm)				Limit (dBm)	Margin (dB)
				Chian 0		Chain 1		Chain 0		Chian 1		AV		PK			
				AV	PK	AV	PK	AV	PK	AV	PK	0+1 (mW)	0+1 (dBm)	0+1 (mW)	0+1 (dBm)		
11n (HT20)	1	2412	6.5	13.15	21.53	13.82	21.1	20.65	142.23	24.10	128.82	44.75	16.51	271.06	24.33	30	-5.67
	6	2437		13.22	20.57	14.07	21.04	20.99	114.02	25.53	127.06	46.52	16.68	241.08	23.82	30	-6.18
	11	2462		13.08	21.33	13.81	20.9	20.32	135.83	24.04	123.03	44.37	16.47	258.86	24.13	30	-5.87
11n (HT40)	3	2422	13	12.58	20.8	13.72	21.24	18.11	120.23	23.55	133.05	41.66	16.20	253.27	24.04	30	-5.96
	6	2437		12.92	20.55	13.48	20.08	19.59	113.50	22.28	101.86	41.87	16.22	215.36	23.33	30	-6.67
	9	2452		12.72	20.01	13.54	20.64	18.71	100.23	22.59	115.88	41.30	16.16	216.11	23.35	30	-6.65

5. Power Spectral Density

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement & Test method	15.247(e) KDB 558074 D01 v03r03	

5.2 Limit for power spectrum density

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

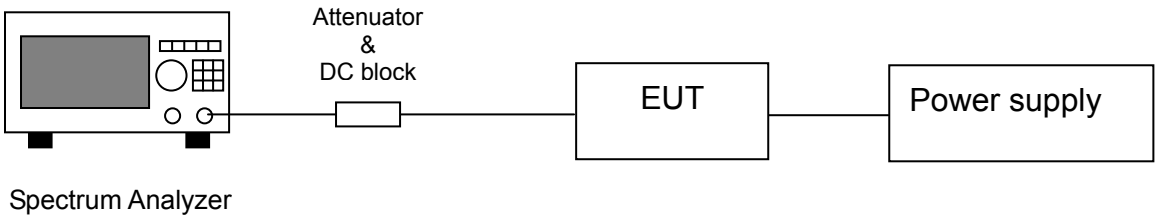
5.3 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	≧3 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Max hold
Span	1.5 times x 6dB bandwidth
Attenuation	Auto

5.4 Test procedure

1. Test procedure refer to clause 10.2 method PKPSD (peak PSD) of KDB 558074 D01 and clause E) 2) b) measure and sum spectral maxima across the outputs.
2. Using the maximum conducted output power in the fundamental emission demonstrates compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
3. Use the peak marker function to determine the maximum amplitude level within the RBW.

5.5 Test diagram



5.6 Test results

Single TX

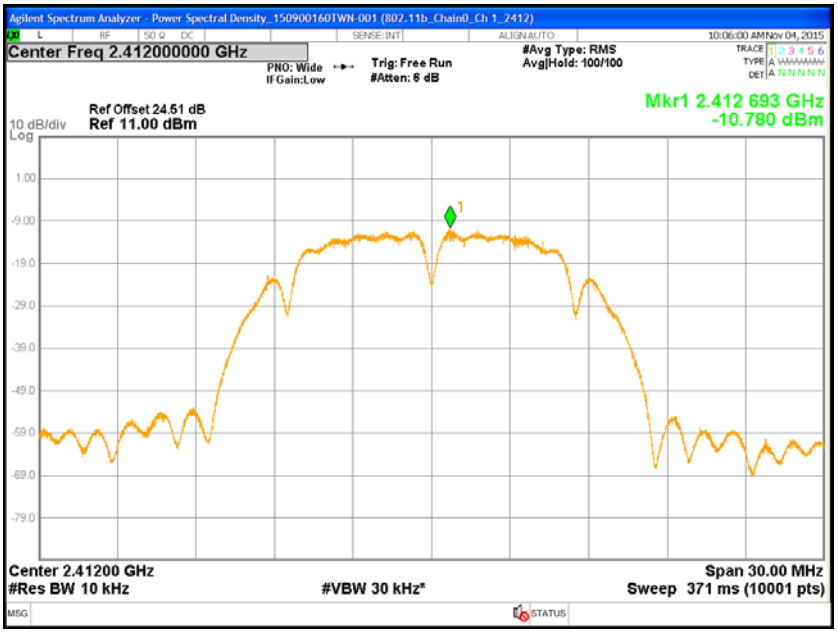
Mode	Channel	Frequency (MHz)	PSD		Limit (dBm)	Margin (dB)
			(dBm)	(mw)		
802.11b (chain0)	1	2412	-10.78	0.08	8	-18.78
	6	2437	-10.18	0.10	8	-18.18
	11	2462	-10.019	0.10	8	-18.02
802.11g (chain0)	1	2412	-11.904	0.06	8	-19.90
	6	2437	-12.002	0.06	8	-20.00
	11	2462	-12.003	0.06	8	-20.00
802.11g (chain1)	1	2412	-11.812	0.07	8	-19.81
	6	2437	-11.651	0.07	8	-19.65
	11	2462	-11.559	0.07	8	-19.56

2TX

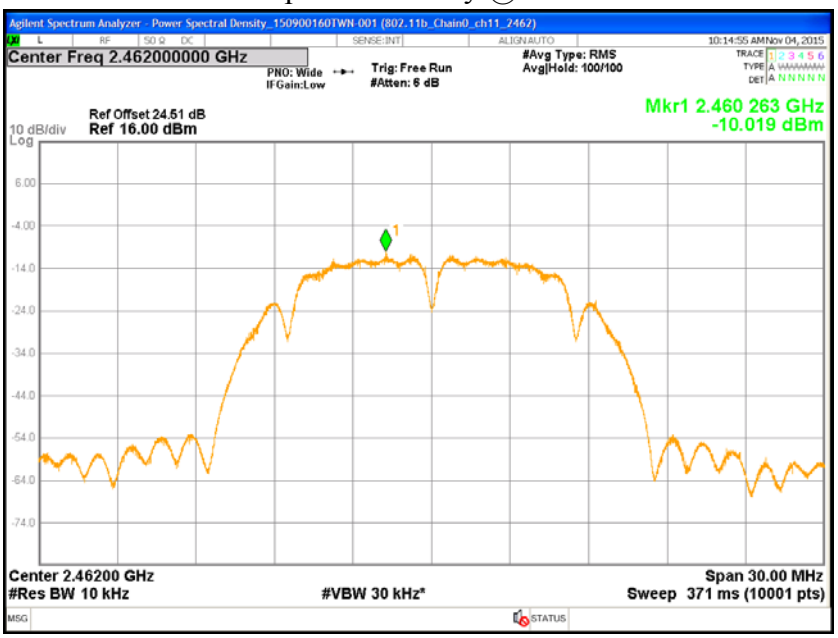
Mode	Channel	Frequency (MHz)	PSD (dBm)		Total PSD		MIMO		Limit (dBm)	Margin (dB)
			chain0	chain1	mW	dBm	Correction	Result		
802.11n (HT20)	1	2412	-13.383	-12.684	0.10	-10.01	10Log(2)	-7.00	8	-15.00
	6	2437	-13.472	-13.098	0.09	-10.27	10Log(2)	-7.26	8	-15.26
	11	2462	-13.412	-12.898	0.10	-10.14	10Log(2)	-7.13	8	-15.13
802.11n (HT40)	3	2422	-16.744	-16.074	0.05	-13.39	10Log(2)	-10.38	8	-18.38
	6	2437	-16.676	-16.264	0.05	-13.45	10Log(2)	-10.44	8	-18.44
	9	2452	-16.141	-15.459	0.05	-12.78	10Log(2)	-9.77	8	-17.77

Note: MIMO Correction: 10log(Nant)

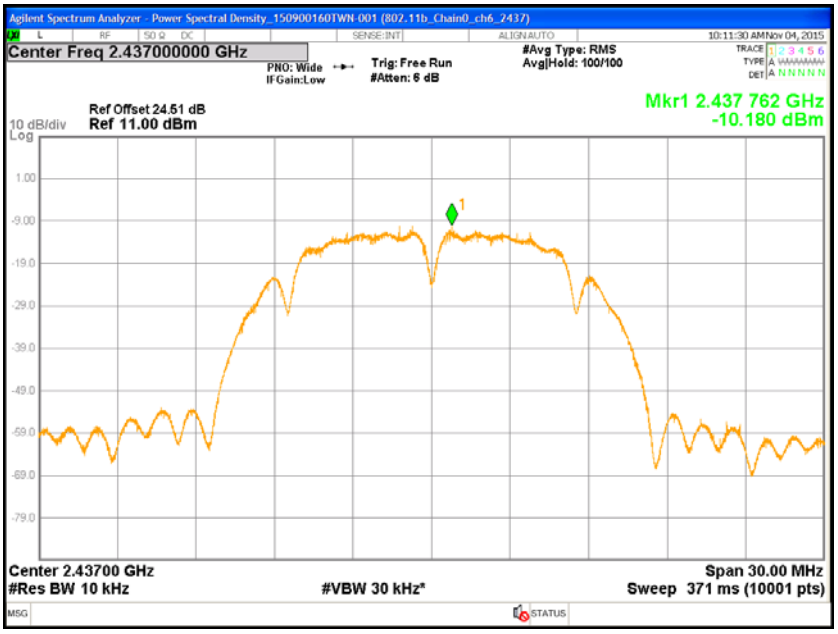
Chain0 : Power Spectral Density @ 802.11b mode Ch 1



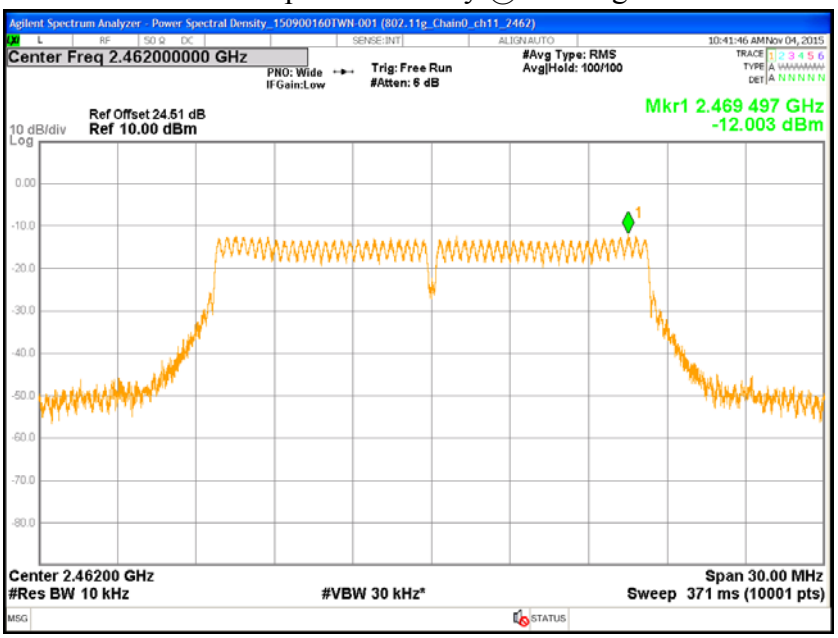
Chain0 : Power Spectral Density @ 802.11b mode ch11



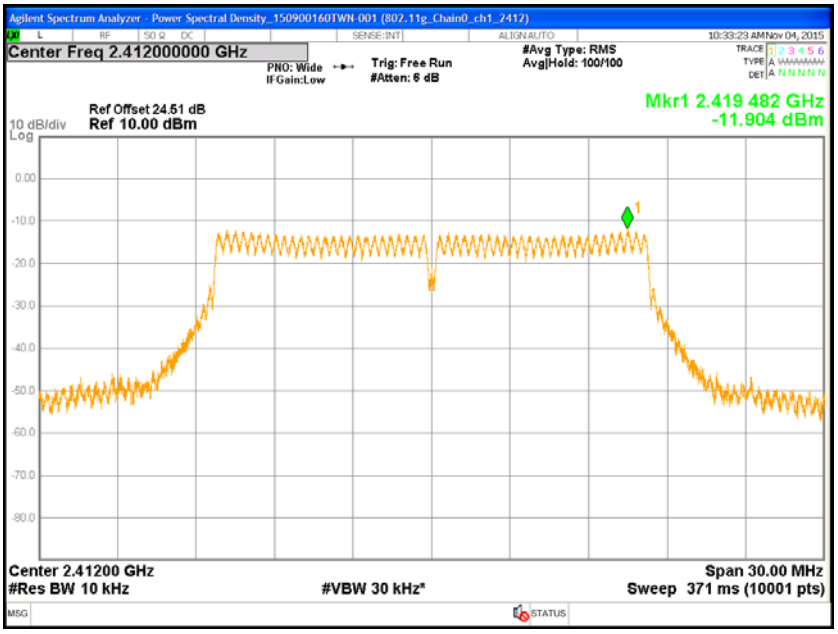
Chain0 : Power Spectral Density @ 802.11b mode ch6



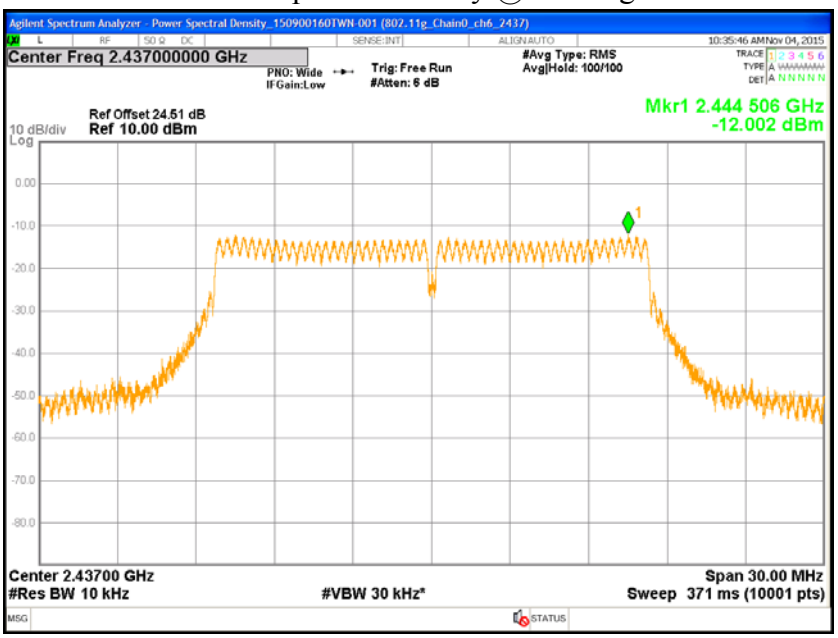
Chain0 : Power Spectral Density @ 802.11g mode ch11



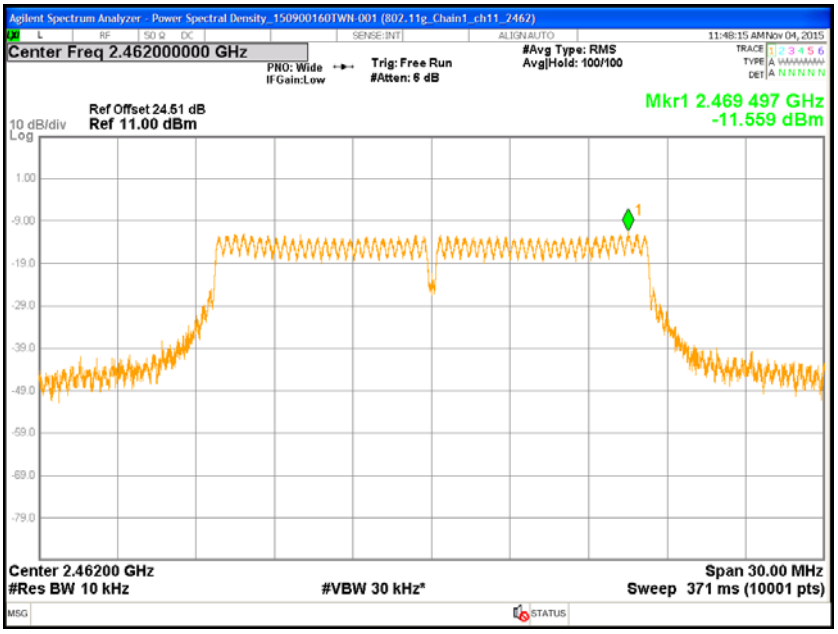
Chain0 : Power Spectral Density @ 802.11g mode ch1



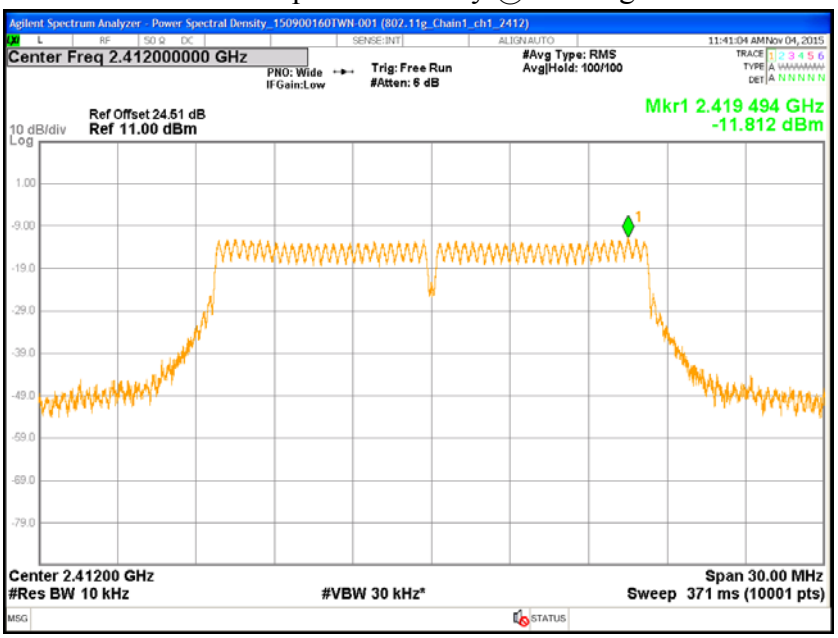
Chain0 : Power Spectral Density @ 802.11g mode ch6



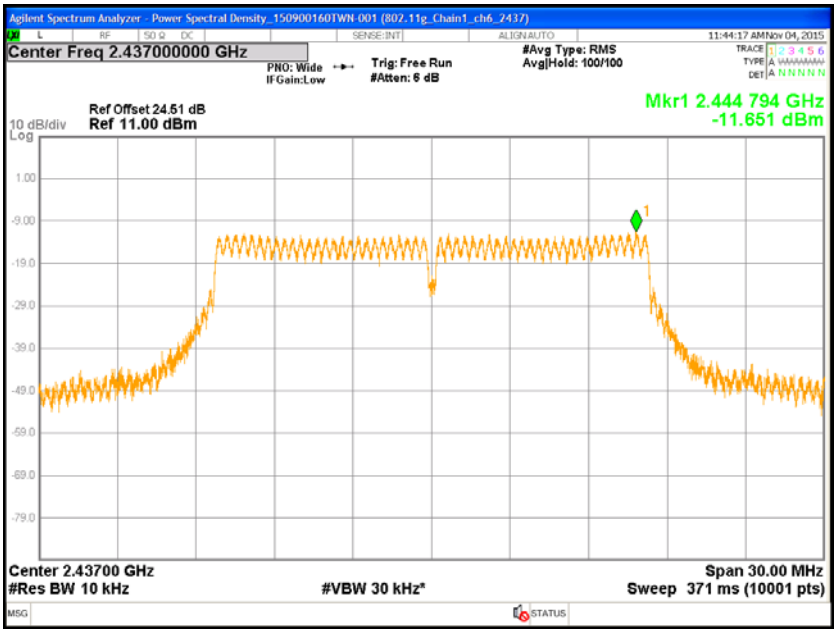
Chain1 : Power Spectral Density @ 802.11g mode ch11



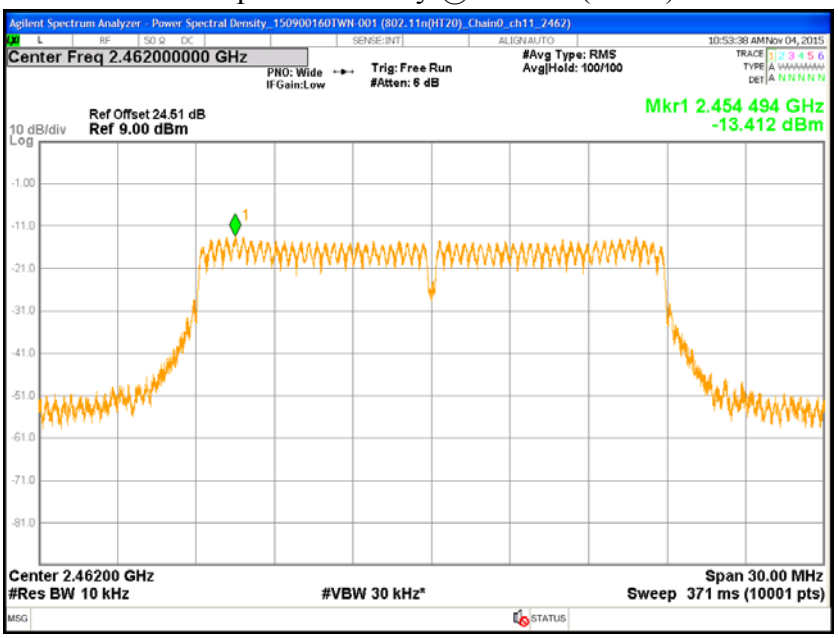
Chain1 : Power Spectral Density @ 802.11g mode ch1



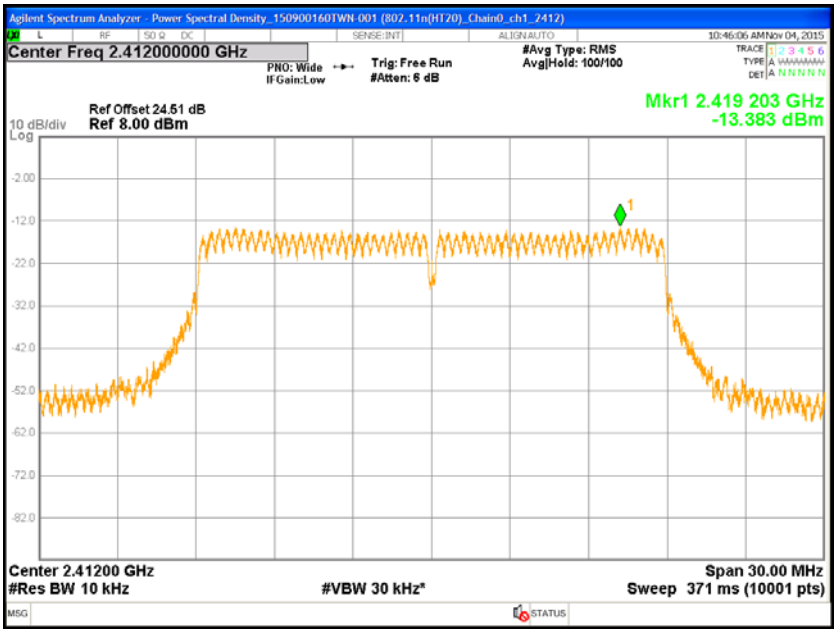
Chain1 : Power Spectral Density @ 802.11g mode ch6



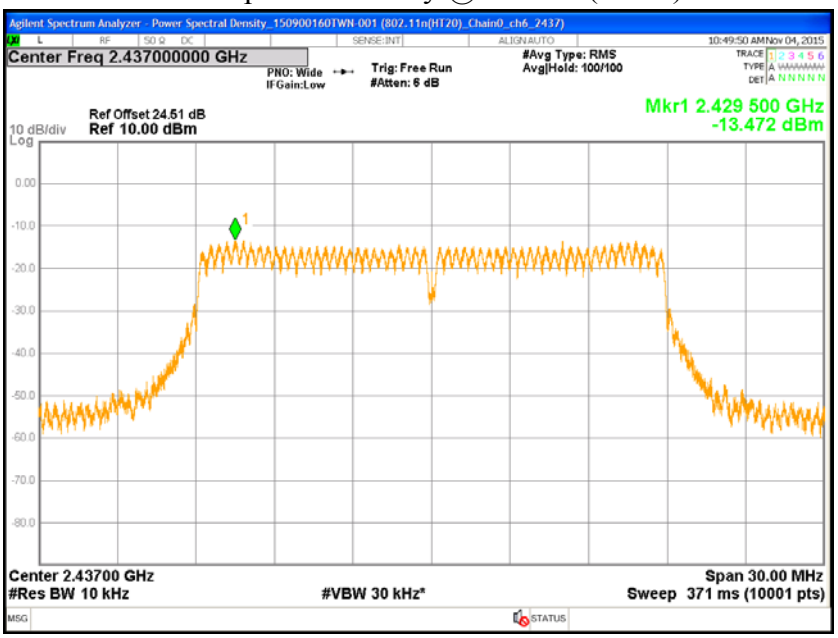
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch11



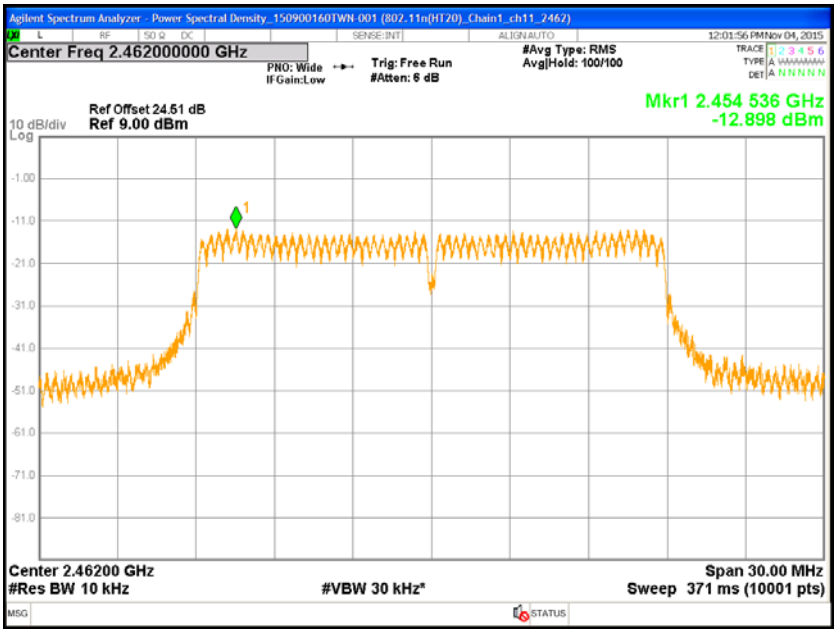
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch1



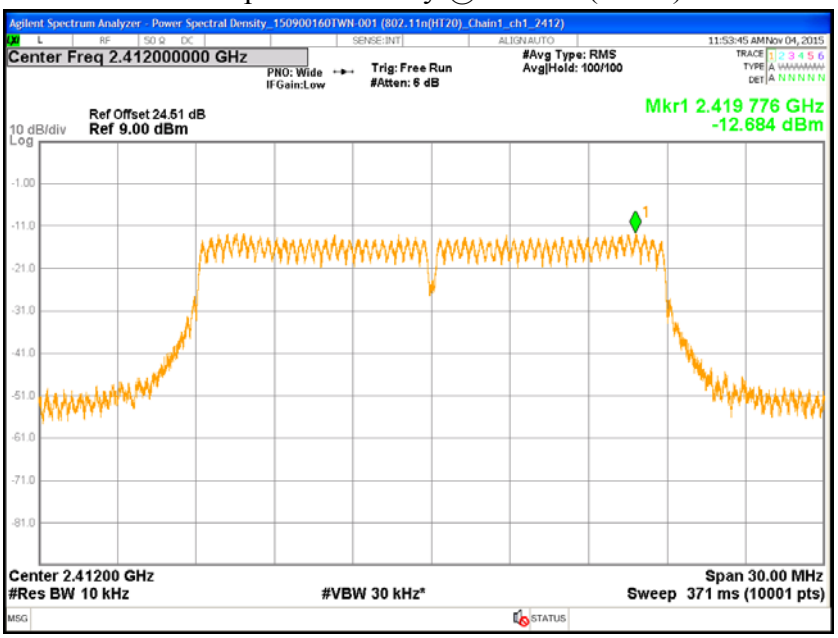
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch6



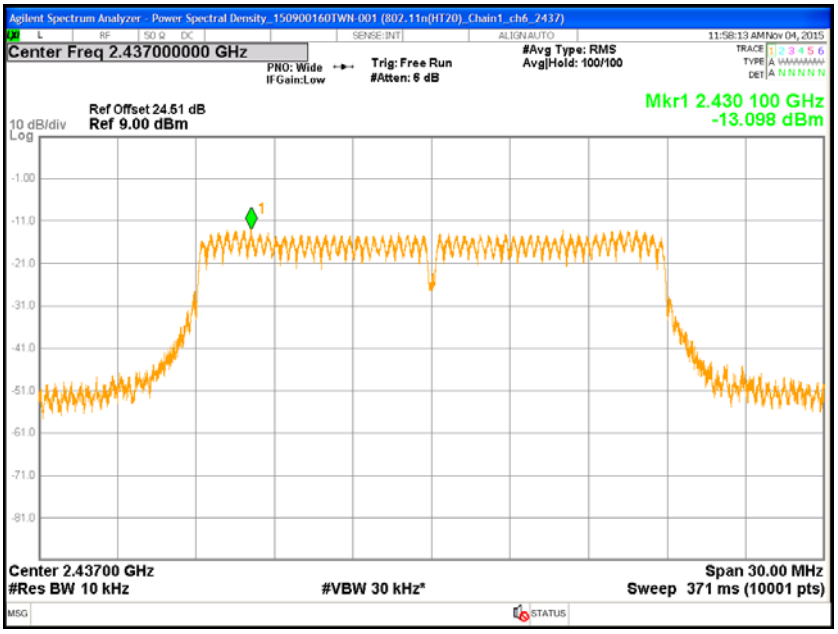
Chain1 : Power Spectral Density @ 802.11n(HT20) mode ch11



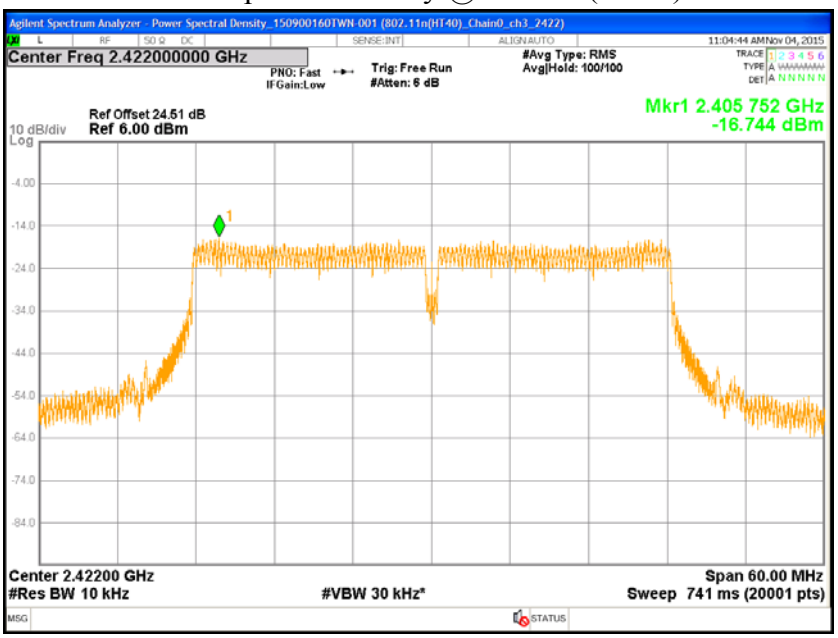
Chain1 : Power Spectral Density @ 802.11n(HT20) mode ch1



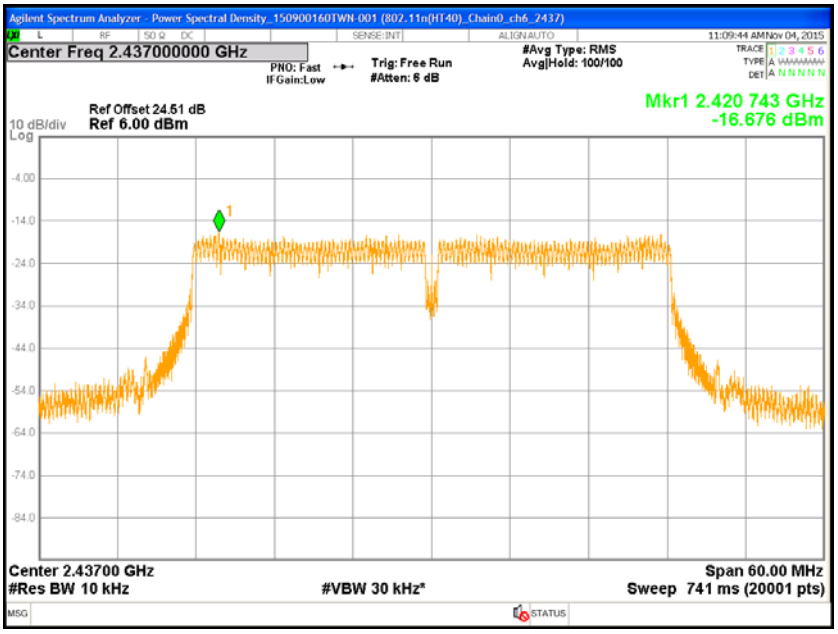
Chain1 : Power Spectral Density @ 802.11n(HT20) mode ch6



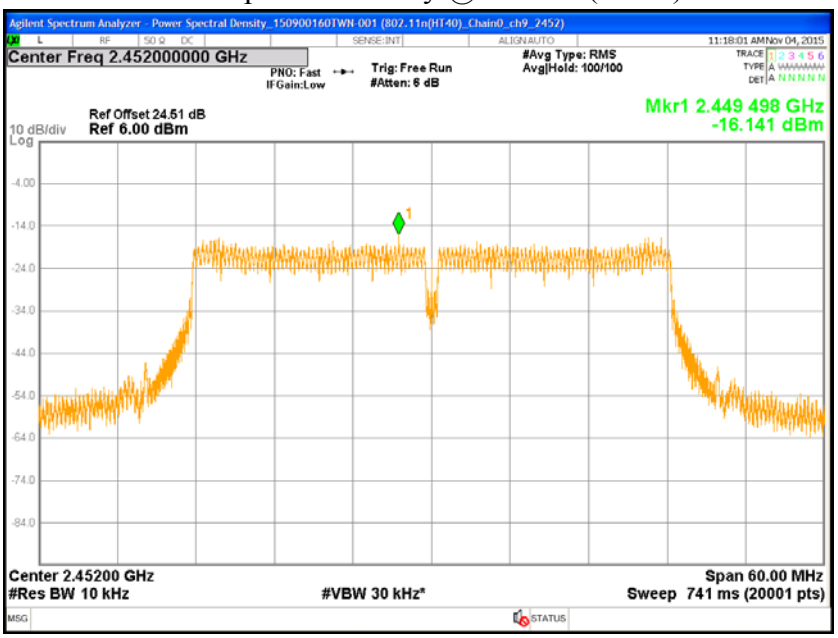
Chain0 : Power Spectral Density @ 802.11n(HT40) mode ch3



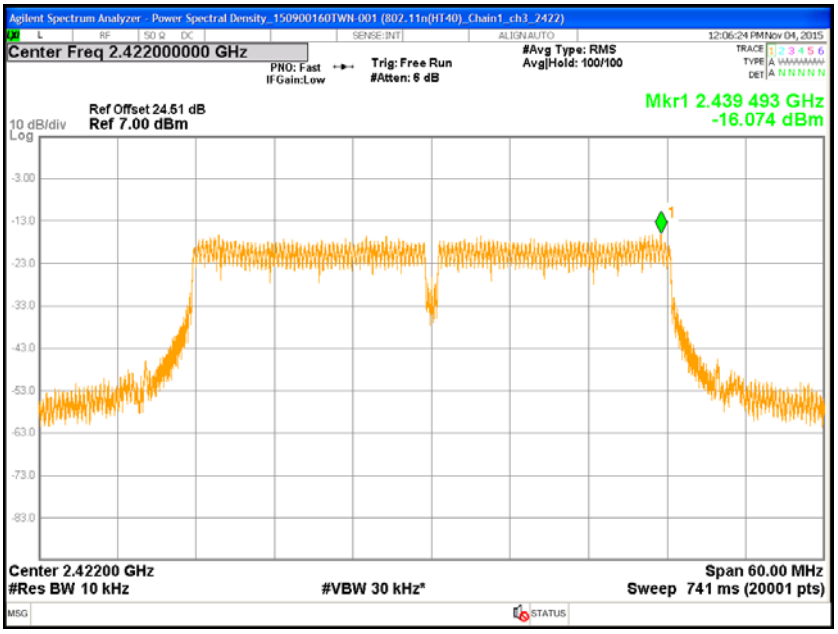
Chain0 : Power Spectral Density @ 802.11n(HT40) mode ch6



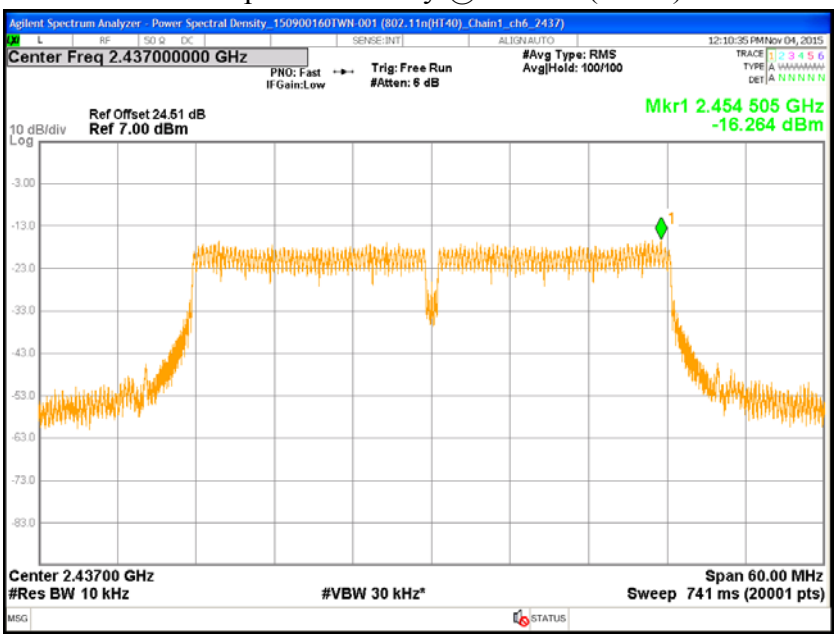
Chain0 : Power Spectral Density @ 802.11n(HT40) mode ch9



Chain1 : Power Spectral Density @ 802.11n(HT40) mode ch3



Chain1 : Power Spectral Density @ 802.11n(HT40) mode ch6



Chain1 : Power Spectral Density @ 802.11n(HT40) mode ch9