EMC
TEST REPORT

Report No.: **161100528TWN-001**

Model No.: **SGW1**

Issued Date: **Dec. 13, 2016**

Applicant: **TAIWAN SHIN-KONG SECURITY CO., LTD.**
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Test Method/ Standard: **47 CFR FCC Part 15.247 & ANSI C63.10 2013**
KDB 558074 D01 v03r05
KDB 662911 D01 v02r01

Registration No.: **93910**

Test By: **Intertek Testing Services Taiwan Ltd.,**
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Testing Laboratory
0597

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Revision History

Report No.	Issue Date	Revision Summary
161100528TWN-001	Dec. 13, 2016	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:	Service robot
Model No:	SGW1
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:	1. 11 channels for 2412 MHz ~ 2462 MHz 2. 9 channels for 2422 MHz ~ 2452 MHz
Frequency of Each Channel:	1. 2412+5 k, k＝0 ~ 10 for 802.11b, 802.11g, 802.11n HT20 2. 2422+5 k, k＝0 ~ 6 for 802.11b, 802.11g, 802.11n HT40
Access scheme:	DSSS, OFDM
Rated Power:	1. DC 3.7 V from battery 2. DC 5 V from USB port
Power Cord:	N/A
Sample Received:	Nov. 21, 2016
Sample condition:	Workable
Test Date(s):	Nov. 23, 2016 ~ Dec. 13, 2016

Note 1: The test report only allows to be revised within three years from its original issued date unless further standard or the requirement was noticed.
Note 2: When determining the test conclusion, the Measurement Uncertainty of test has been considered.
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2.2 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain:	3.39 dBi
Antenna Type:	PIFA Antenna
Connector Type:	I-PEX

2.3 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	Description of Data Cable
Notebook PC	DELL	Vostro 3350	7KFQNT1	Mini USB cable 0.5 meter

2.4 Operation mode

TX-MODE is based on the program "Tera term" 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.

Please refer the details below:

802.11b ch6 chain0		802.11g ch6 chain0	
Data rate (Mbps)	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**
1	14.30	6	12.39
2	13.90	9	12.30
5.5	13.83	12	12.18
11	13.77	18	12.11
		24	11.97
		36	11.80
		48	11.74
		54	11.63

802.11n HT20 ch6 chain0		802.11n HT40 ch6 chain0	
Data rate (Mbps)	**AV (dBm)**	**Data rate (Mbps)**	**AV (dBm)**
MCS0	12.56	MCS0	12.18
MCS1	12.31	MCS1	12.1
MCS2	12.19	MCS2	11.97
MCS3	12.08	MCS3	11.85
MCS4	12	MCS4	11.8
MCS5	11.91	MCS5	11.69
MCS6	11.75	MCS6	11.65
MCS7	11.69	MCS7	11.55

2.5 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
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
Maximum peak conducted output power	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
Power Spectral Density	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
RF Antenna Conducted Spurious	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
Radiated spurious Emission 9kHz~1GHz	802.11 b	6	11	Chain0
Radiated Spurious Emission 10GHz~10th Harmonic	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
Restricted-Band Band edge	802.11 b	1	1, 6 , 11	Chain0
	802.11 g	6	1, 6, 11	Chain0
	802.11 n (HT20)	6.5	1, 6, 11	Chain0
	802.11 n (HT40)	13.5	3, 6, 9	Chain0
AC Power Line Conducted Emission	Normal Link			

2.6 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	Channel	Frequency	Power setting
802.11b (chain0)	1	2412	41
	6	2437	41
	11	2462	41
802.11g (chain0)	1	2412	48
	6	2437	48
	11	2462	48
802.11n (HT20)	1	2412	48
	6	2437	48
	11	2462	48
802.11n (HT40)	3	2422	48
	6	2437	48
	9	2452	48

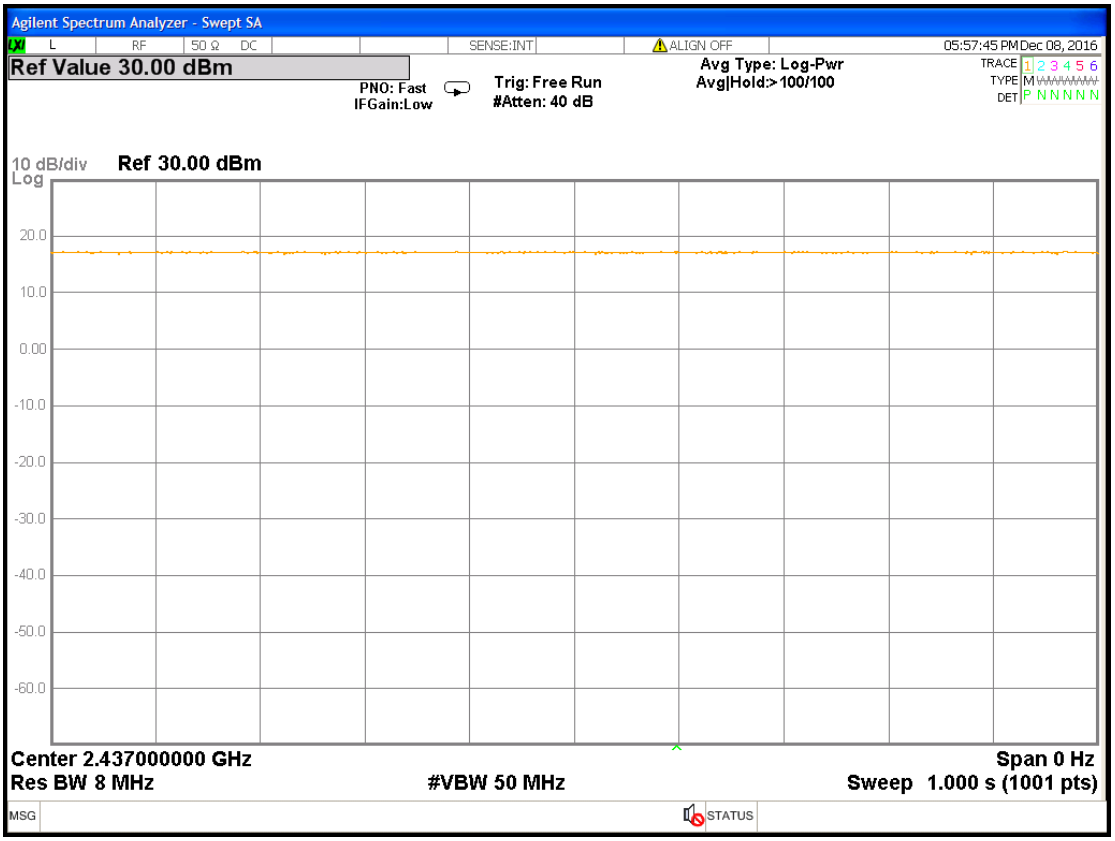
Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

Mode	Channel	Frequency (MHz)	Data rate	Signal on time	Total signal transmit time	Duty cycle	Duty Cycle factor
802.11b	6	2437	1	1	1	1.000	0.000
802.11g	6	2437	6	1	1	1.000	0.000
802.11n (HT20)	6	2437	6.5	1	1	1.000	0.000
802.11n (HT40)	6	2437	13.5	1	1	1.000	0.000

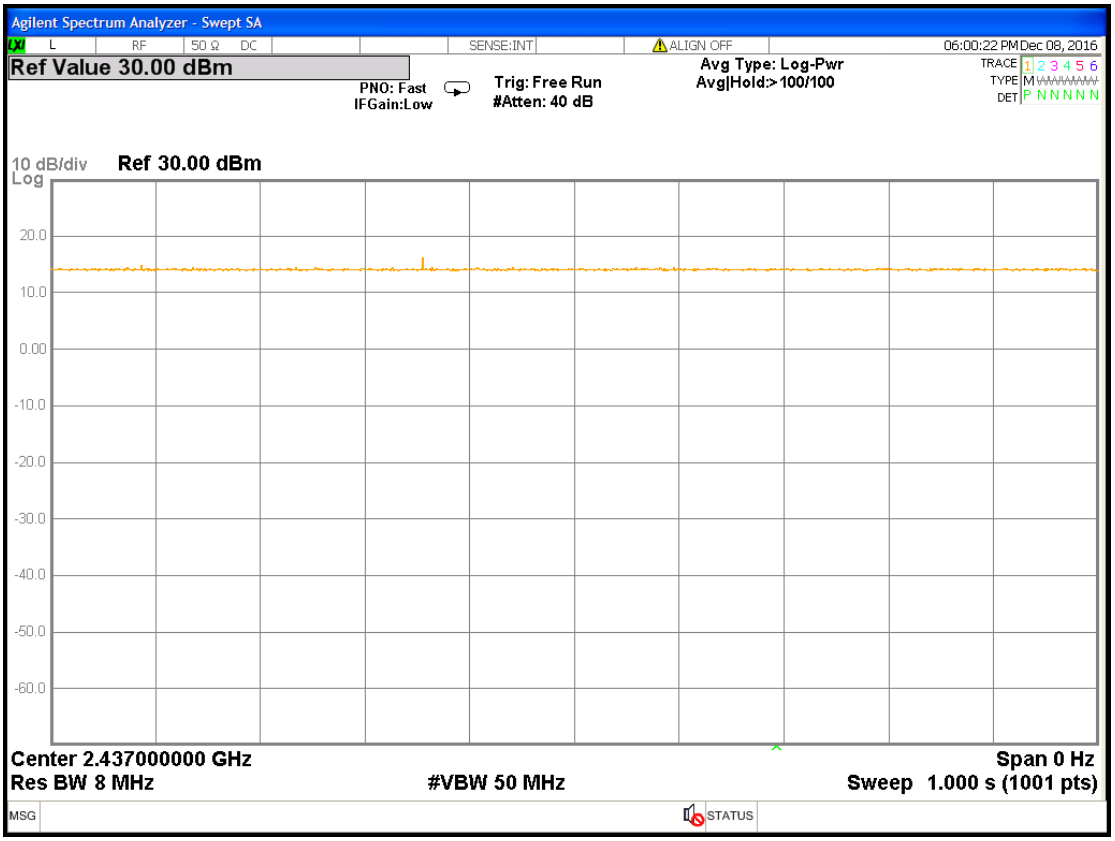
Chain0 : Duty cycle @ 802.11b mode Ch 6

Chain0 : Duty cycle @ 802.11g mode Ch 6

Chain0 : Duty cycle @ 802.11n(HT20) mode Ch 6



Chain0 : 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 v03r05	

3.2 Limit for minimum 6dB bandwidth

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

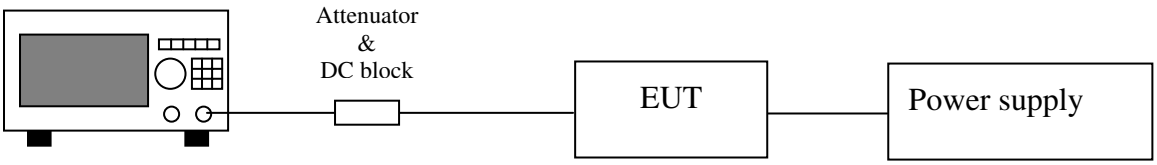
3.3 Measuring instrument setting

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

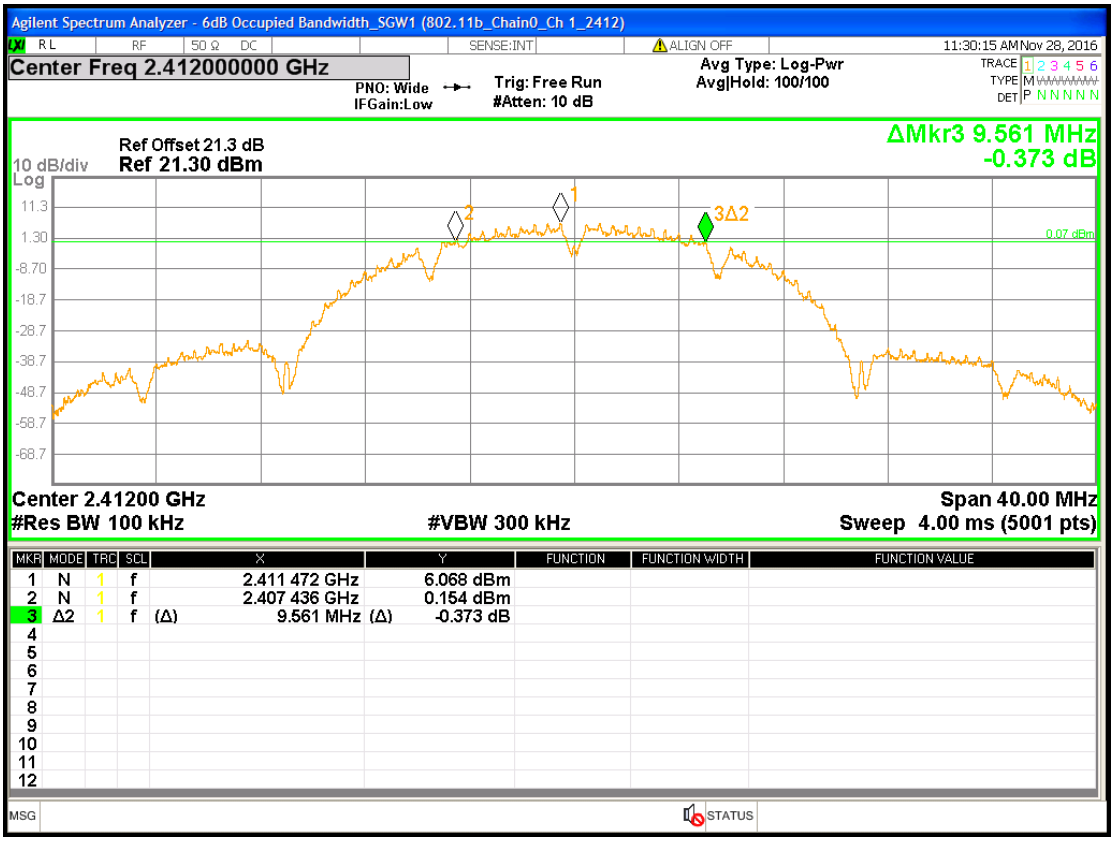


3.6 Test results

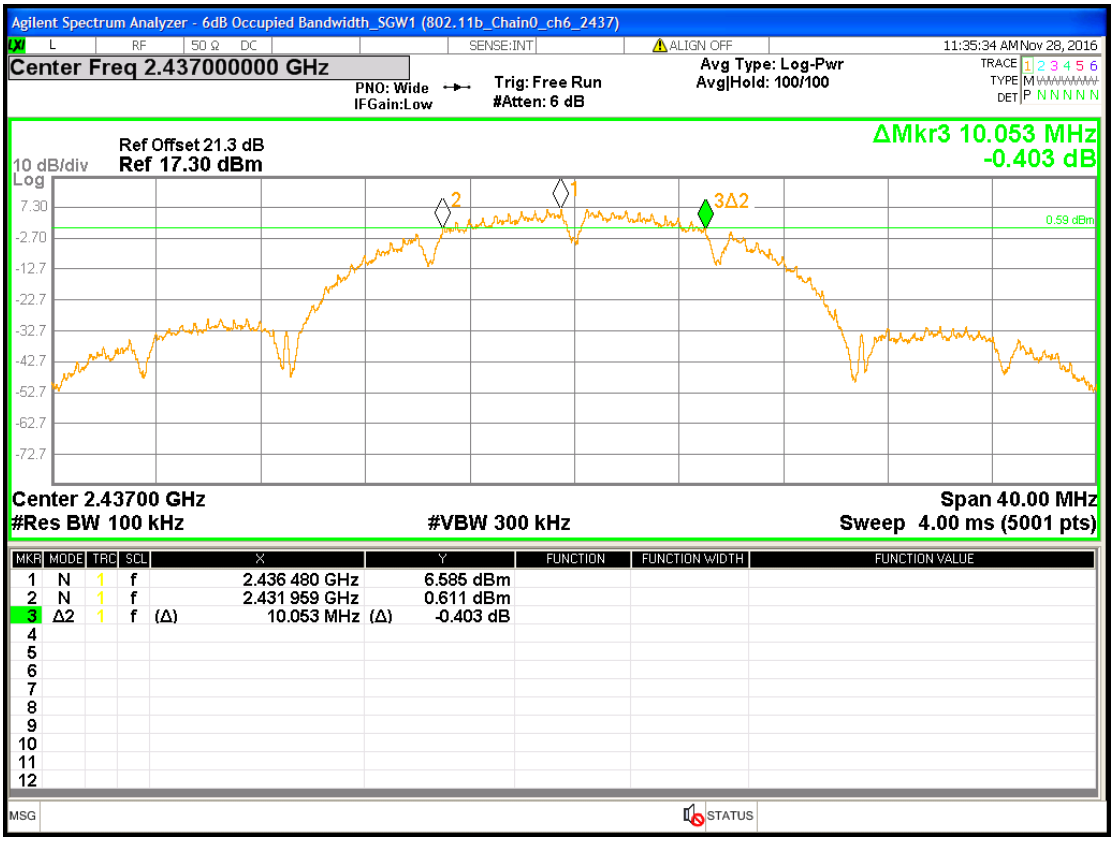
Single TX

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
802.11b (chain0)	1	2412	9.561	> 0.5
	6	2437	10.053	> 0.5
	11	2462	9.739	> 0.5
802.11g (chain0)	1	2412	16.559	> 0.5
	6	2437	16.558	> 0.5
	11	2462	16.547	> 0.5
802.11n(HT20) (chain0)	1	2412	17.777	> 0.5
	6	2437	17.754	> 0.5
	11	2462	17.788	> 0.5
802.11n(HT40) (chain0)	1	2422	36.328	> 0.5
	6	2437	36.348	> 0.5
	11	2452	36.311	> 0.5

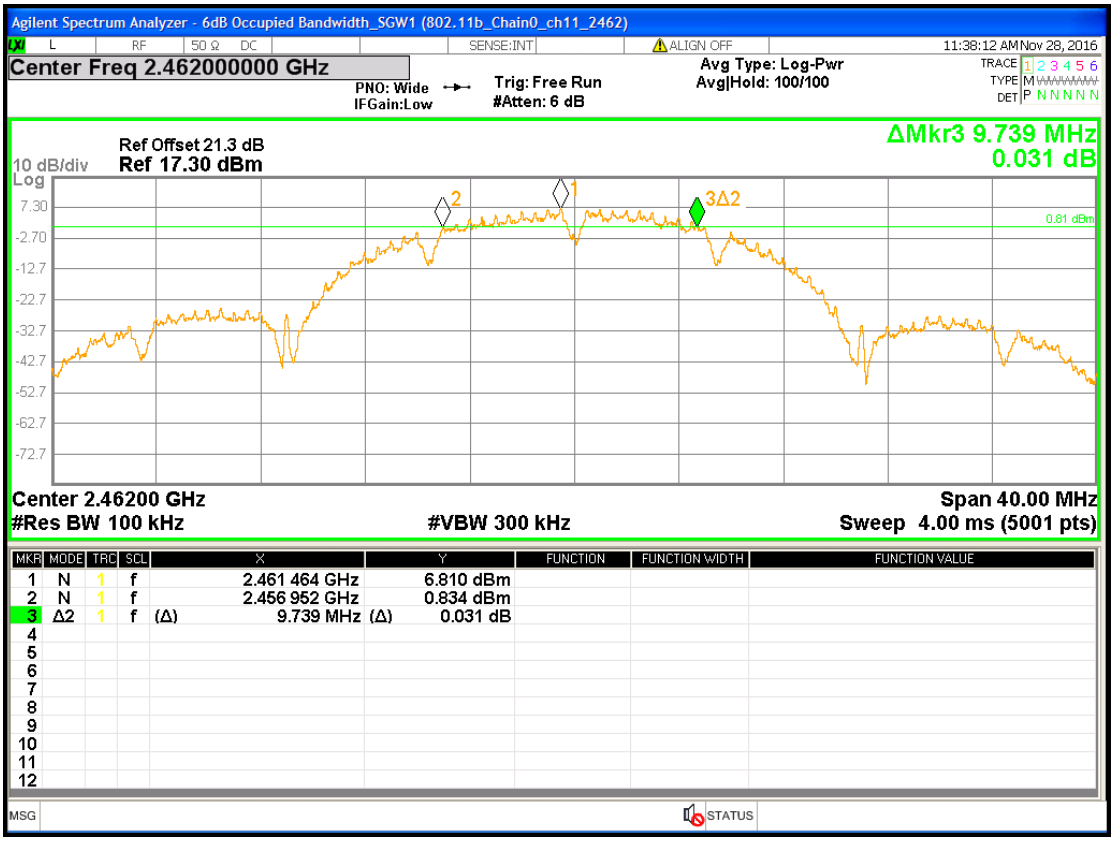
Chain0 : 6dB Bandwidth @ 802.11b mode Ch 1



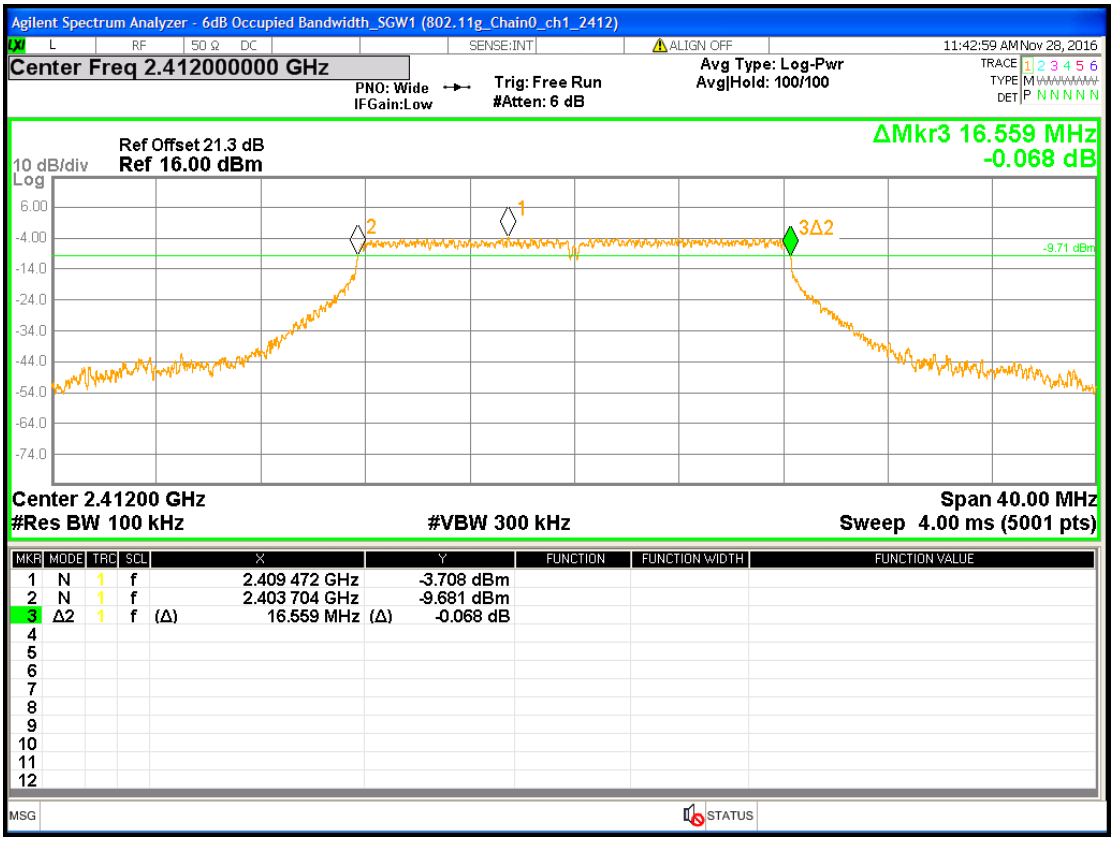
Chain0 : 6dB Bandwidth @ 802.11b mode ch6



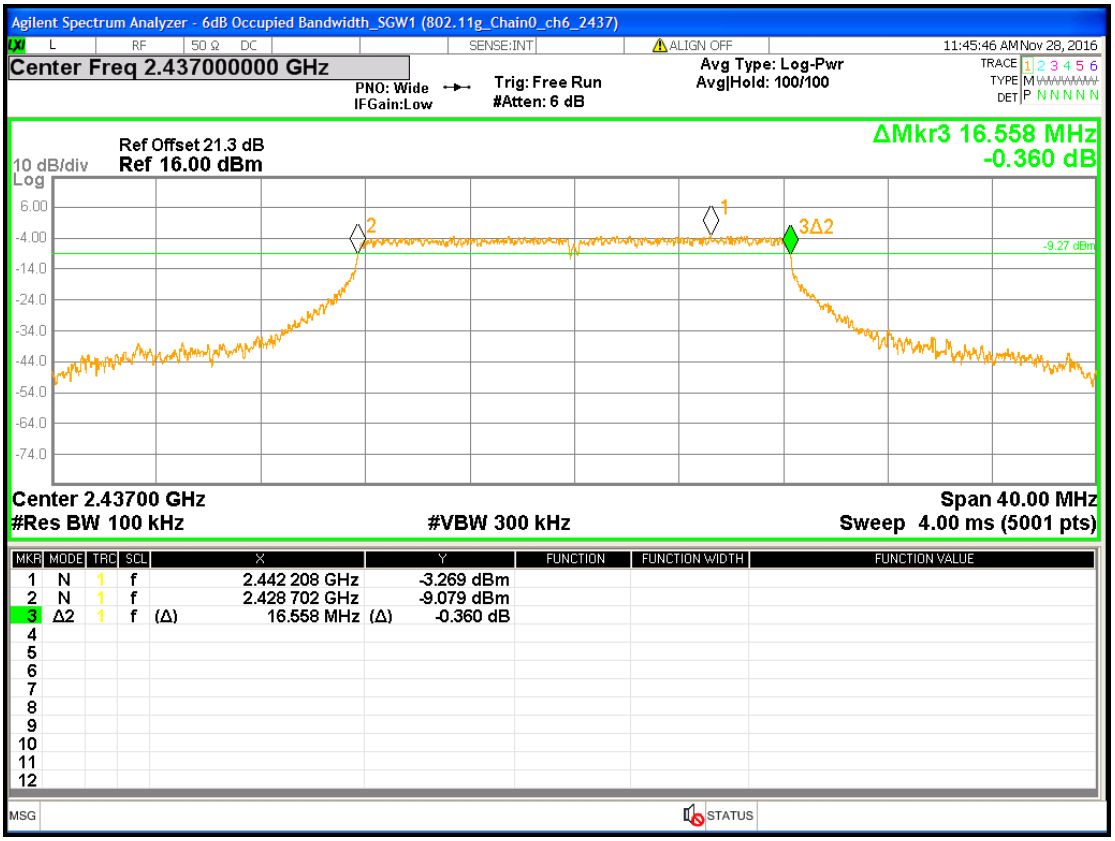
Chain0 : 6dB Bandwidth @ 802.11b mode ch11



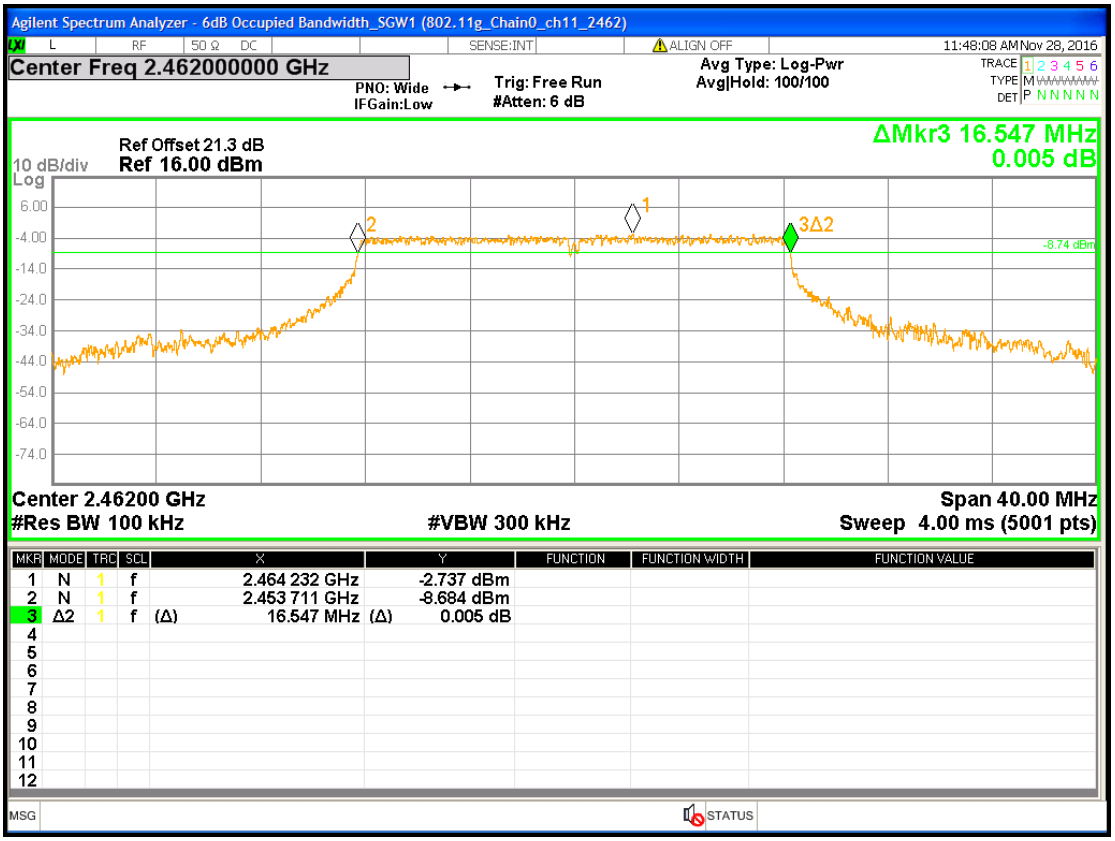
Chain0 : 6dB Bandwidth @ 802.11g mode ch1



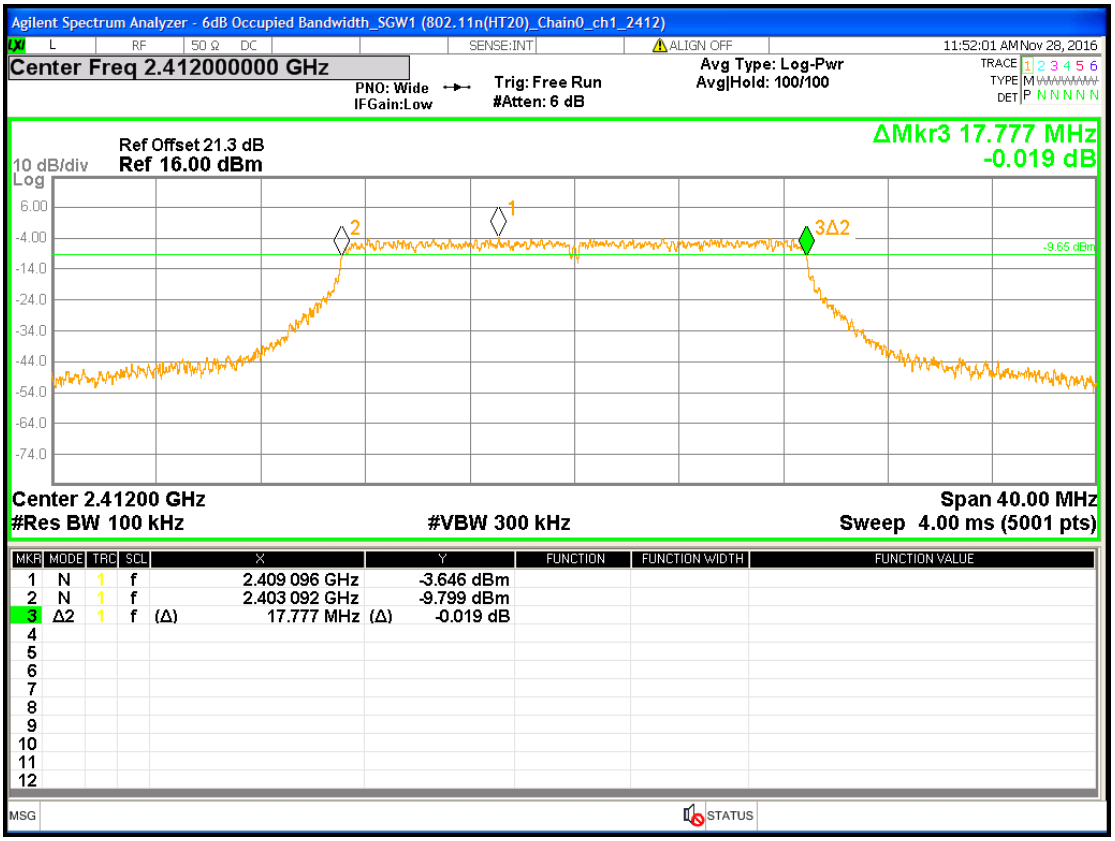
Chain0 : 6dB Bandwidth @ 802.11g mode ch6



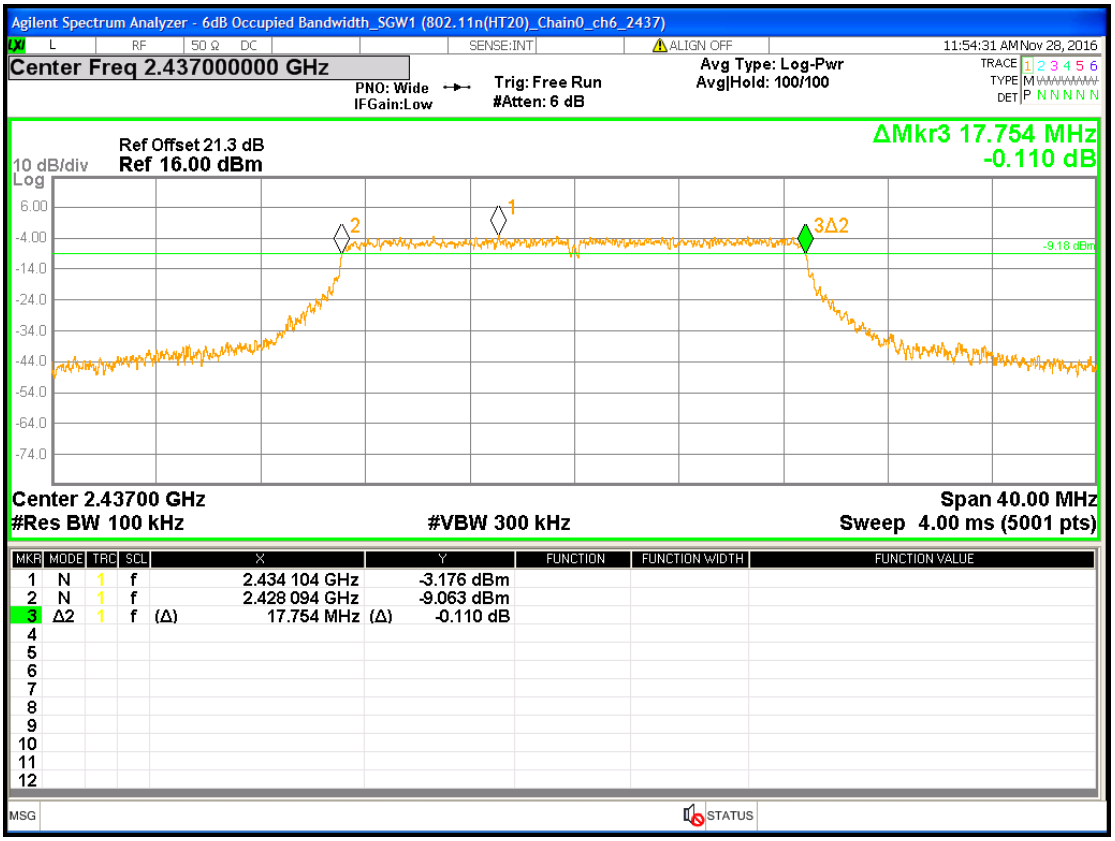
Chain0 : 6dB Bandwidth @ 802.11g mode ch11



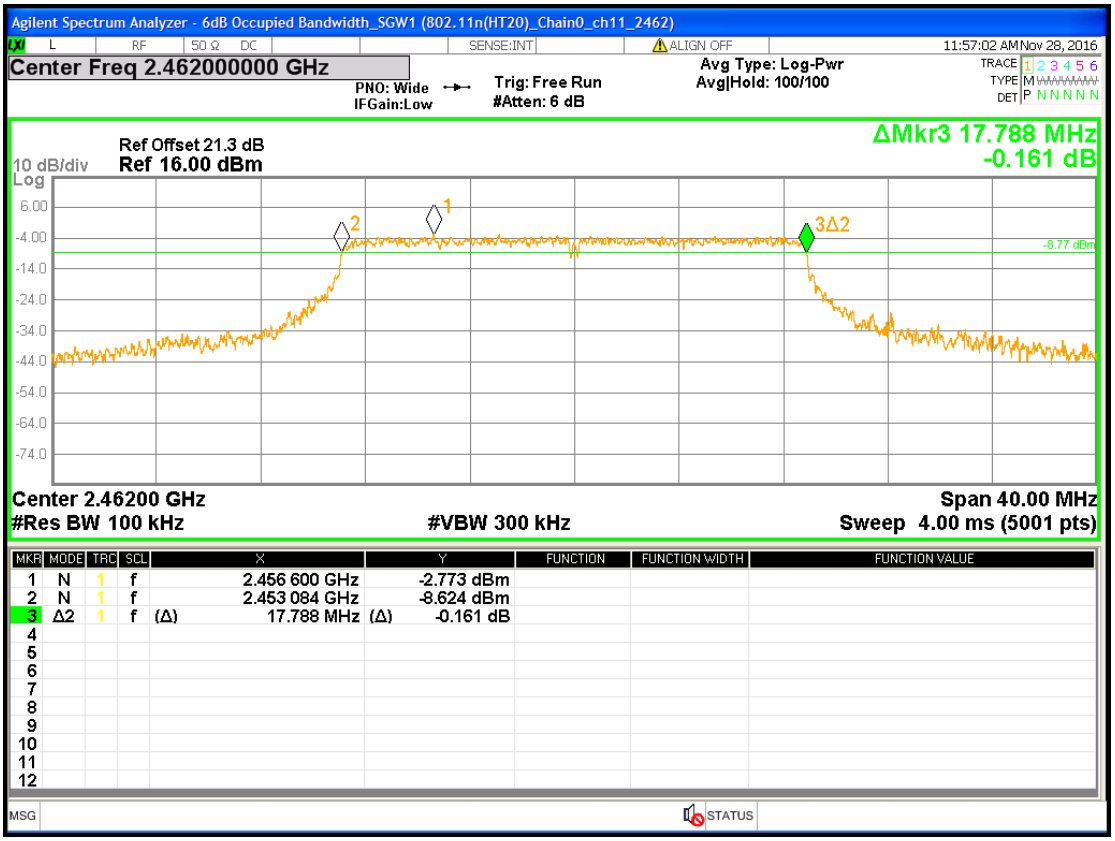
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch1



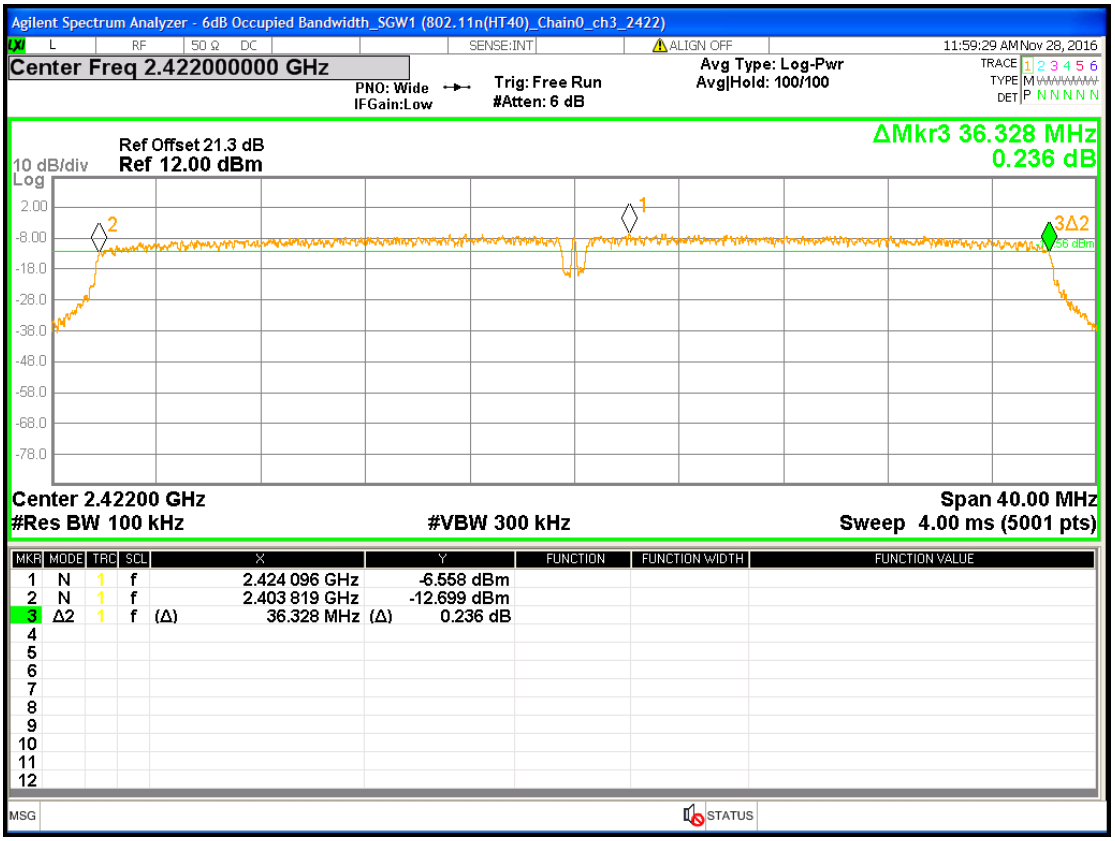
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch6



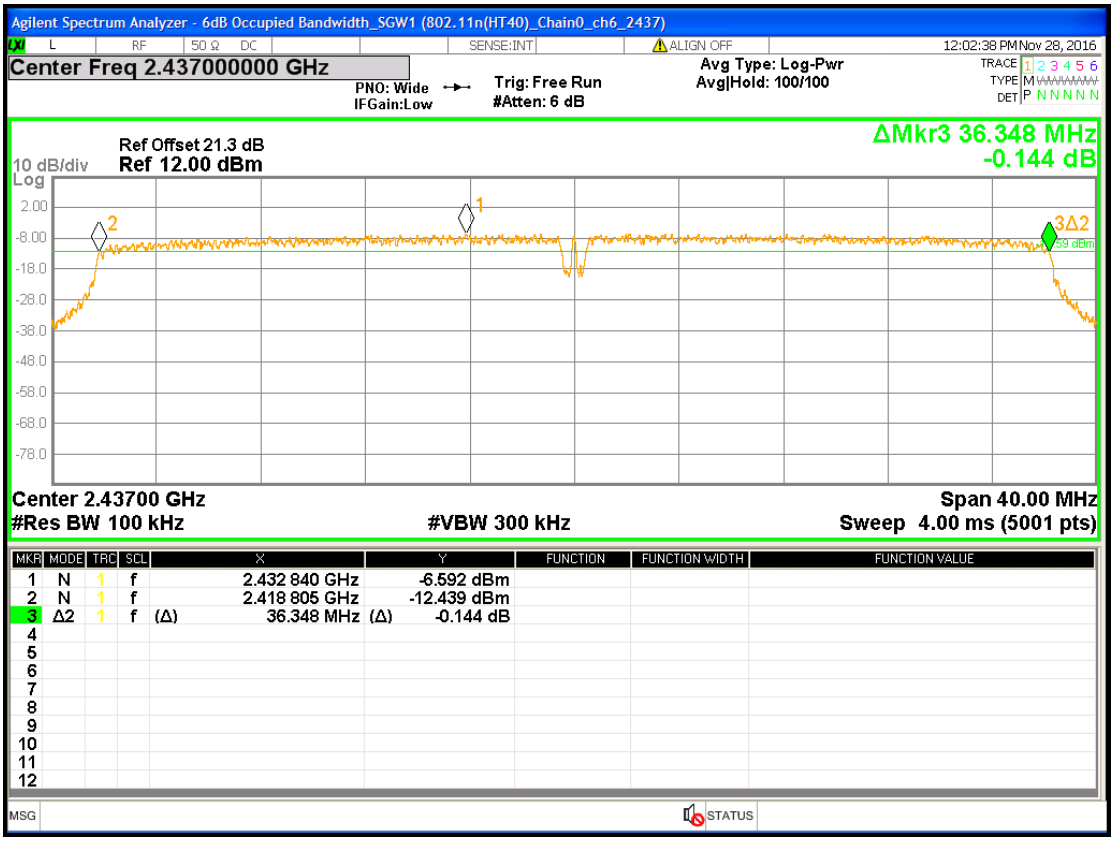
Chain0 : 6dB Bandwidth @ 802.11n(HT20) mode ch11



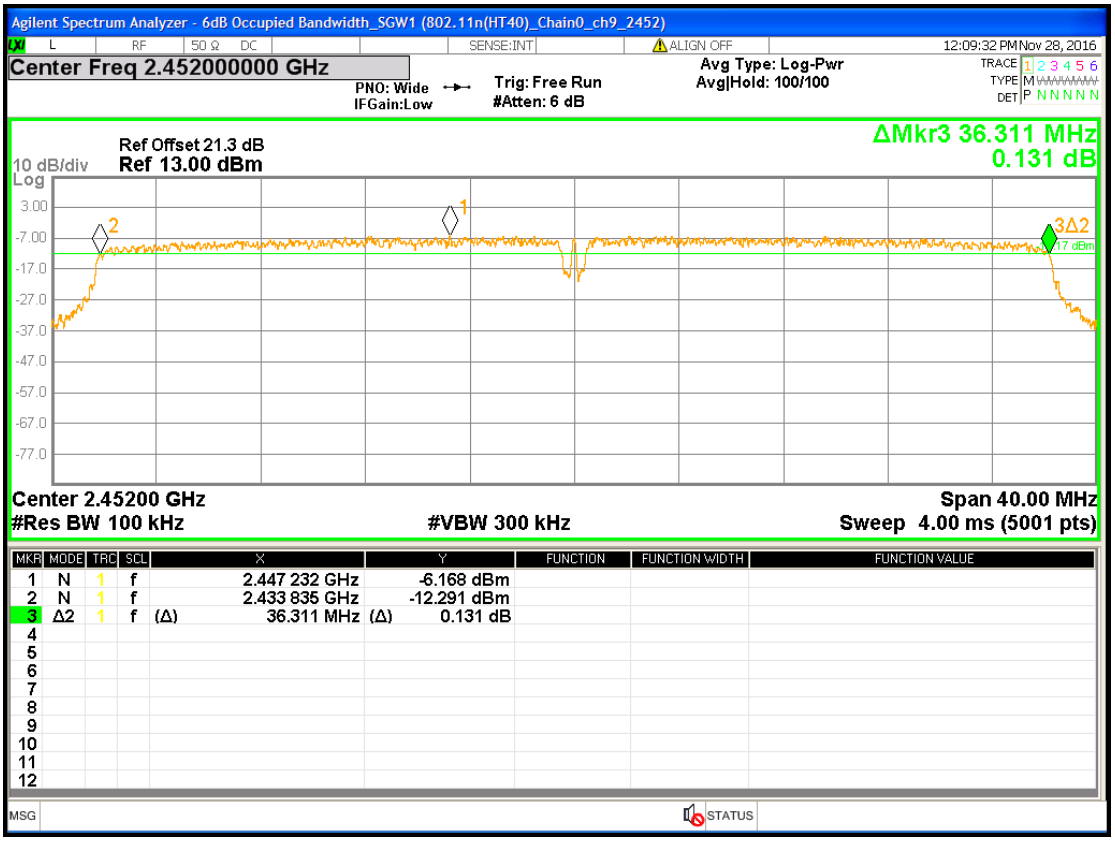
Chain0 : 6dB Bandwidth @ 802.11n(HT40) mode ch3



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



Chain0 : 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 v03r05	

4.2 Limit for maximum peak conducted output power

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

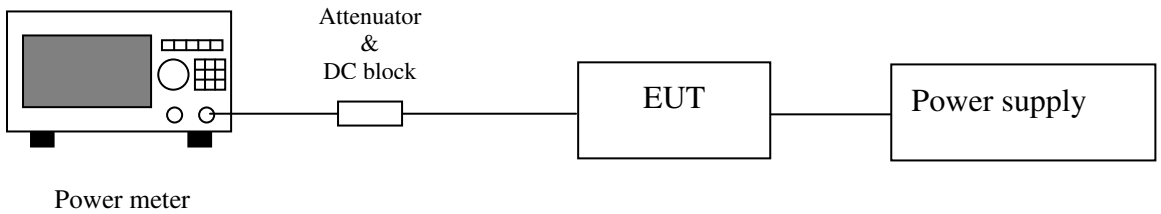
4.3 Measuring instrument setting

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)	Maximum power (PK) (dBm)	Maximum power (PK) (mW)	Limit (dBm)	Margin (dB)
802.11b (chain0)	1	2412	1	13.98	25.00	16.72	46.99	30	-13.28
	6	2437		14.30	26.92	16.98	49.89	30	-13.02
	11	2462		14.71	29.58	17.33	54.08	30	-12.67
802.11g (chain0)	1	2412	6	11.87	15.38	21.05	127.35	30	-8.95
	6	2437		12.39	17.34	21.12	129.42	30	-8.88
	11	2462		12.86	19.32	20.88	122.46	30	-9.12
802.11n(HT20) (chain0)	1	2412	6.5	12.07	16.11	20.85	121.62	30	-9.15
	6	2437		12.56	18.03	20.93	123.88	30	-9.07
	11	2462		12.98	19.86	20.66	116.41	30	-9.34
802.11n(HT40) (chain0)	3	2422	13	11.86	15.35	20.19	104.47	30	-9.81
	6	2437		12.18	16.52	20.39	109.40	30	-9.61
	9	2452		12.56	18.03	20.33	107.89	30	-9.67

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 v03r05	

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

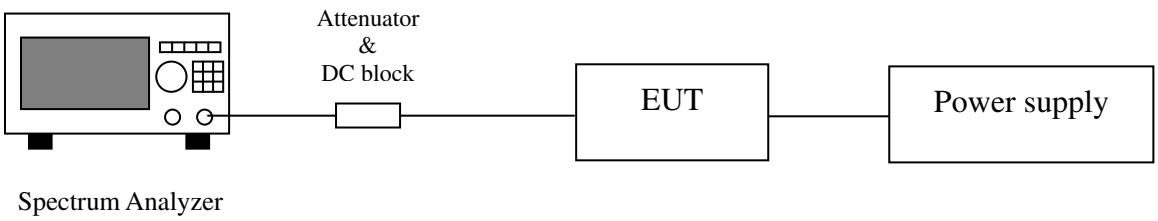
5.3 Measuring instrument setting

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

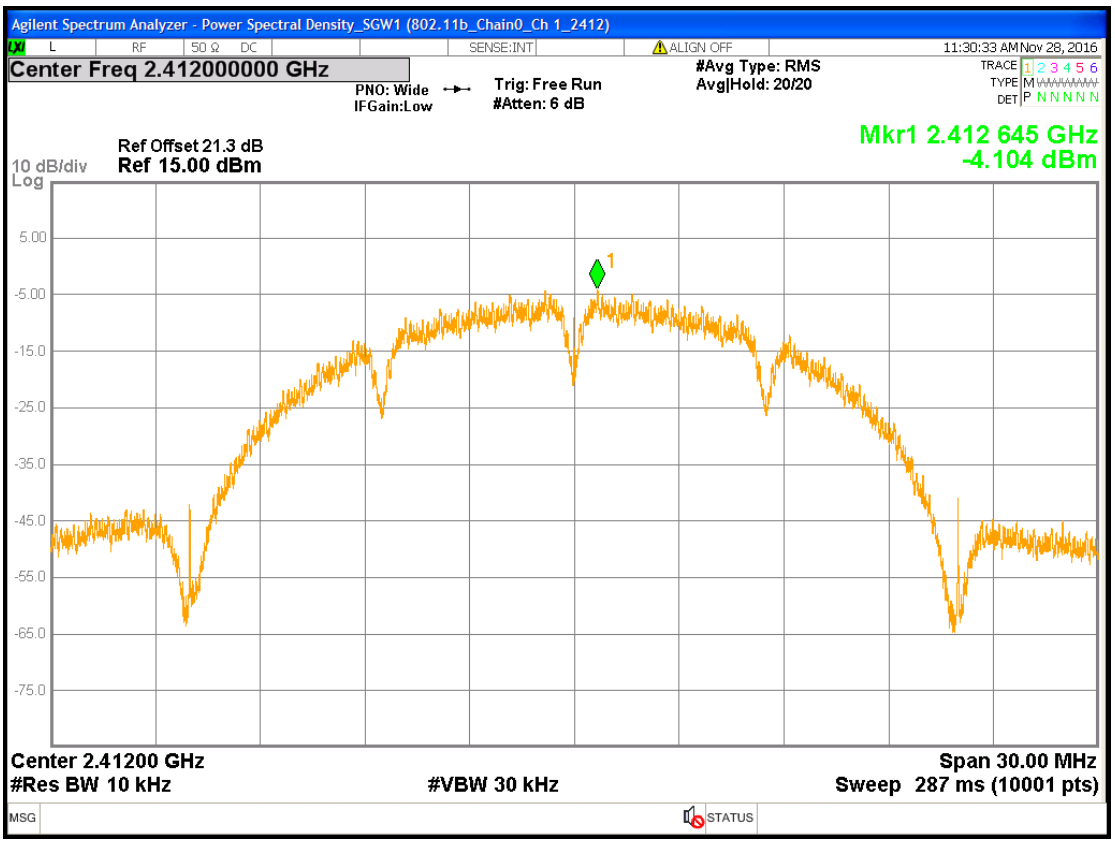


5.6 Test results

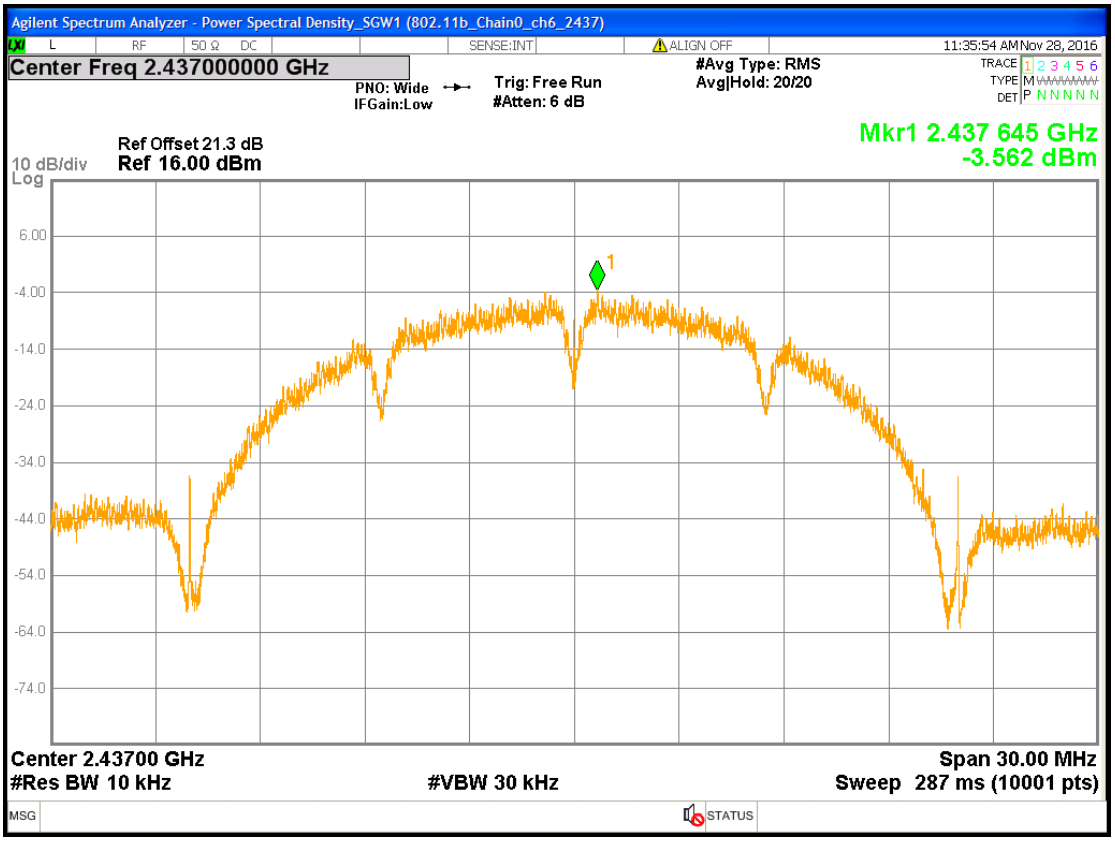
Mode	Channel	Frequency (MHz)	RBW factor	PSD in 10 kHz	PSD in 3kHz		Limit (dBm)	Margin (dB)
					(dBm)	(mW)		
802.11b (chain0)	1	2412	5.229	-4.104	-9.33	0.117	8	-17.33
	6	2437	5.229	-3.562	-8.79	0.132	8	-16.79
	11	2462	5.229	-3.563	-8.79	0.132	8	-16.79
802.11g (chain0)	1	2412	5.229	-9.18	-14.41	0.036	8	-22.41
	6	2437	5.229	-8.676	-13.90	0.041	8	-21.90
	11	2462	5.229	-8.186	-13.41	0.046	8	-21.41
802.11n (HT20) (chain0)	1	2412	5.229	-9.304	-14.53	0.035	8	-22.53
	6	2437	5.229	-8.633	-13.86	0.041	8	-21.86
	11	2462	5.229	-8.124	-13.35	0.046	8	-21.35
802.11n (HT40) (chain0)	3	2422	5.229	-9.287	-14.52	0.035	8	-22.52
	6	2437	5.229	-8.903	-14.13	0.039	8	-22.13
	9	2452	5.229	-8.493	-13.72	0.042	8	-21.72

Remark: RBW Correction: 10*log(10kHz/3kHz)

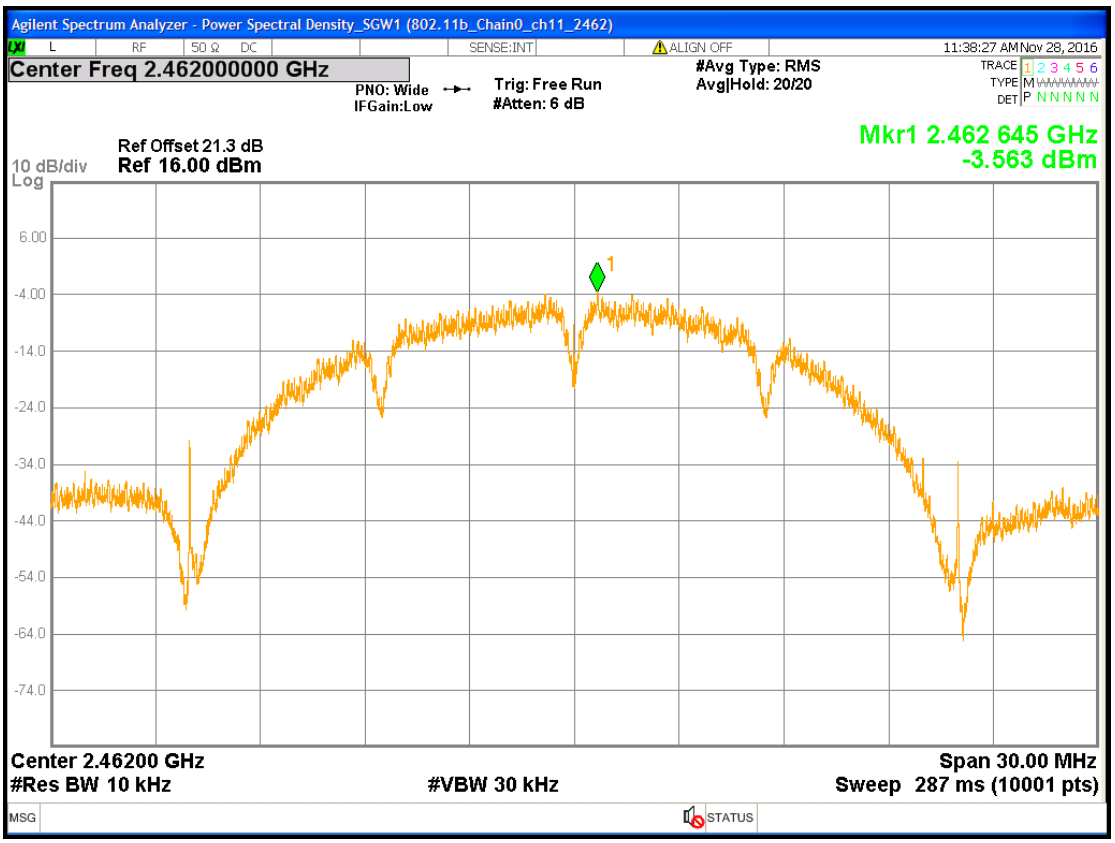
Chain0 : Power Spectral Density @ 802.11b mode Ch 1



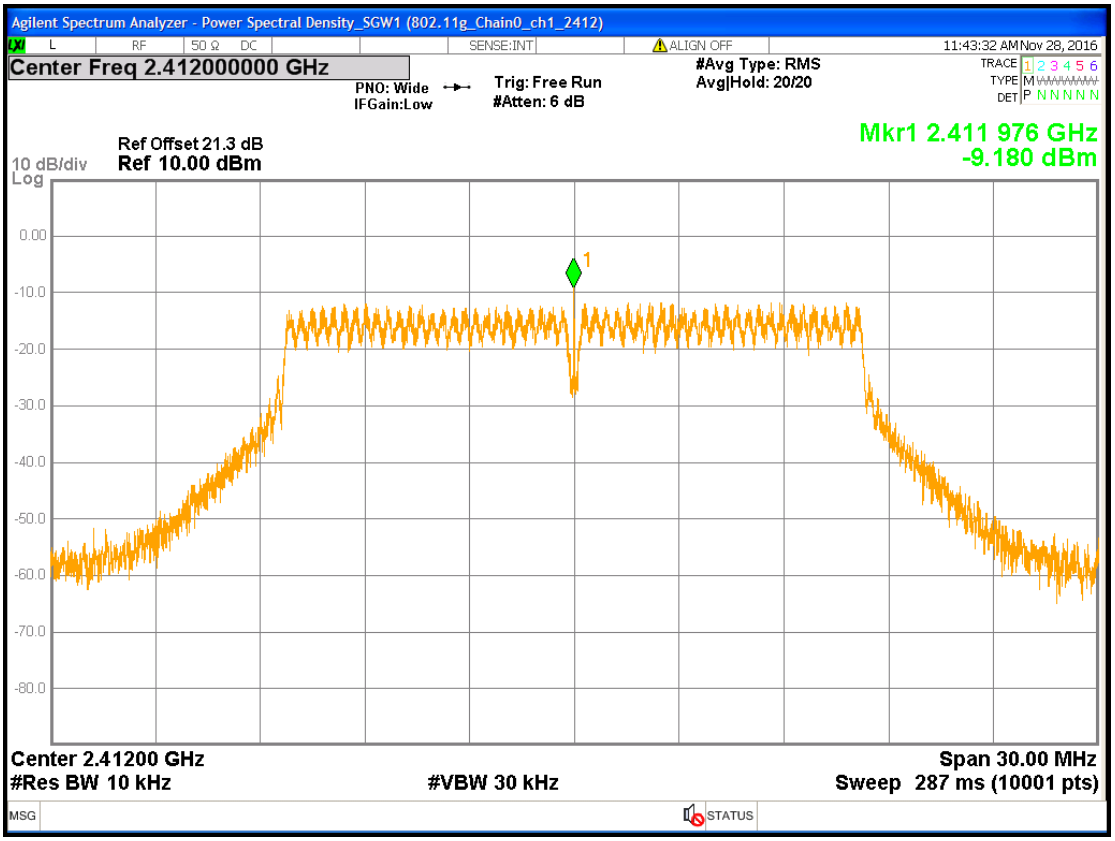
Chain0 : Power Spectral Density @ 802.11b mode ch6



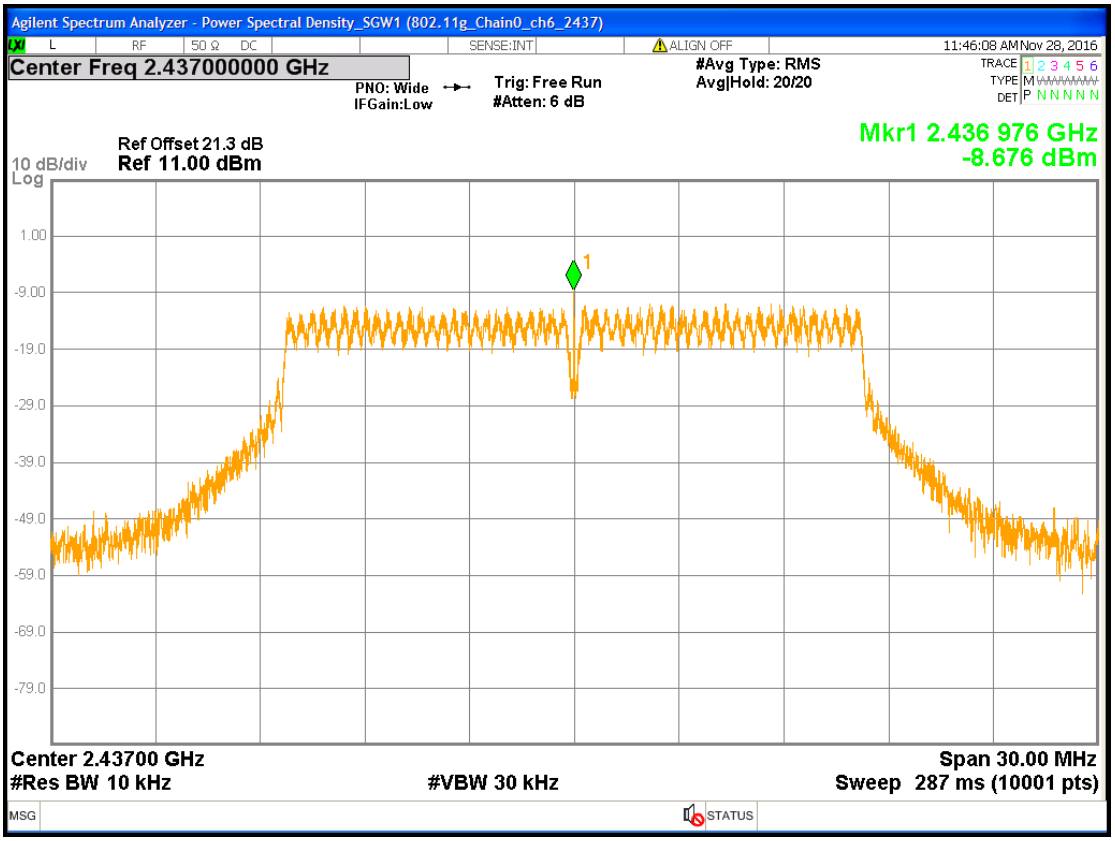
Chain0 : Power Spectral Density @ 802.11b mode ch11



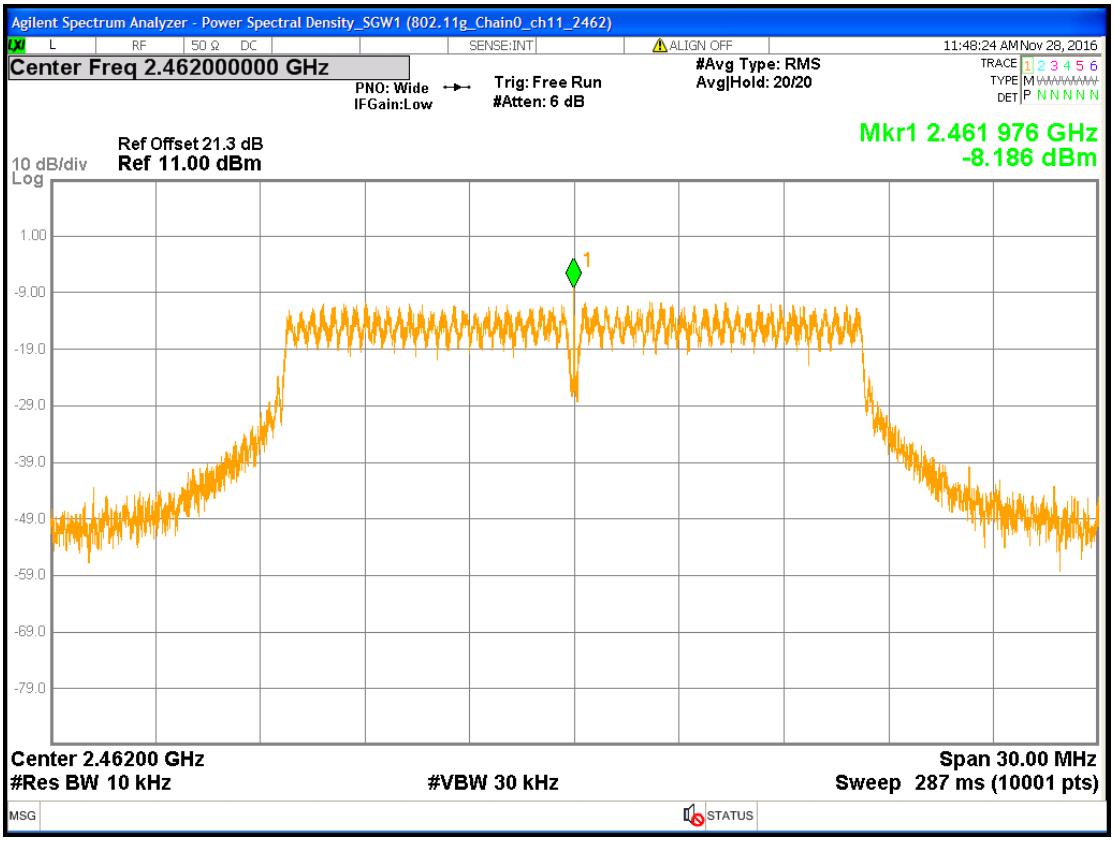
Chain0 : Power Spectral Density @ 802.11g mode ch1



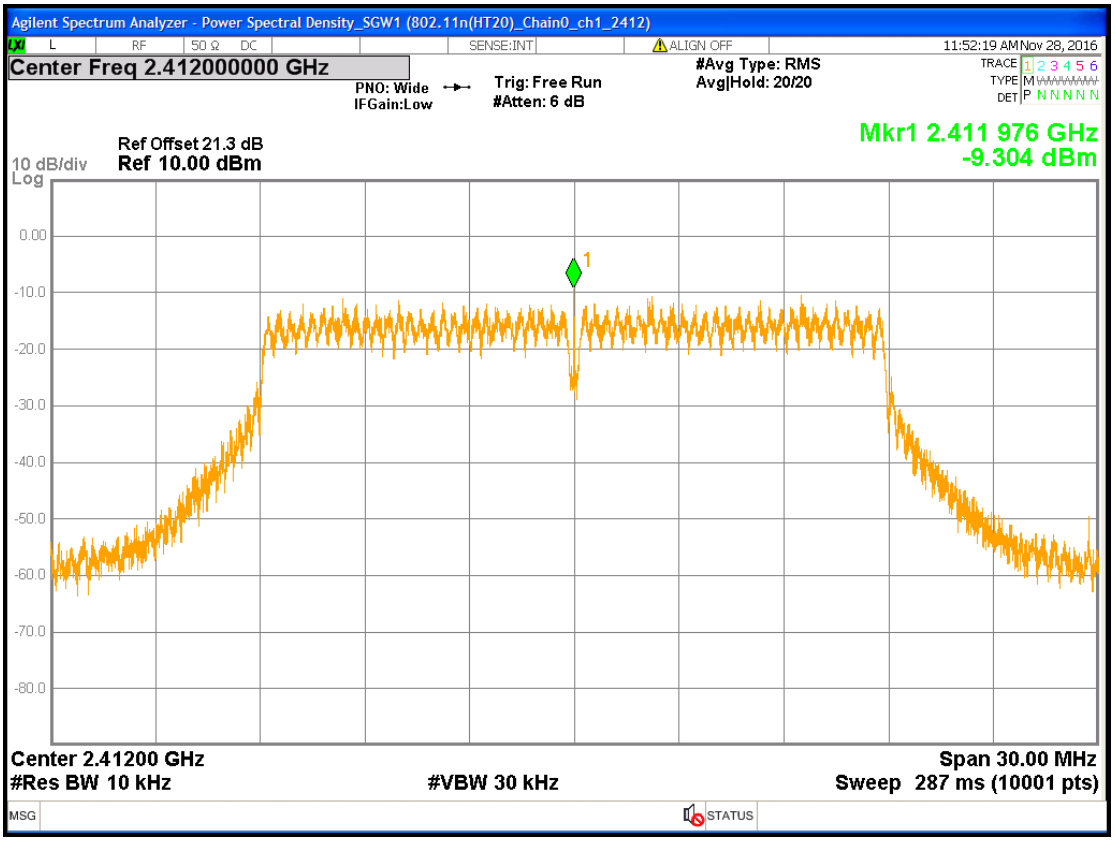
Chain0 : Power Spectral Density @ 802.11g mode ch6



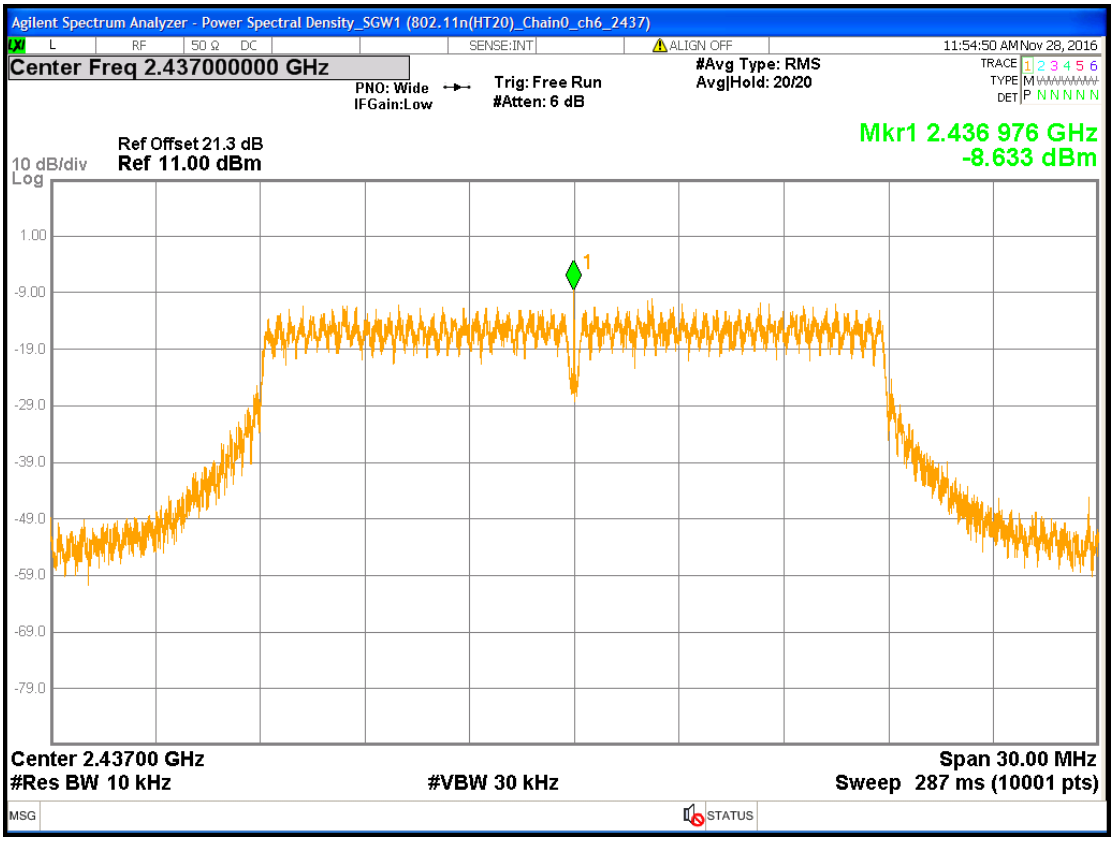
Chain0 : Power Spectral Density @ 802.11g mode ch11



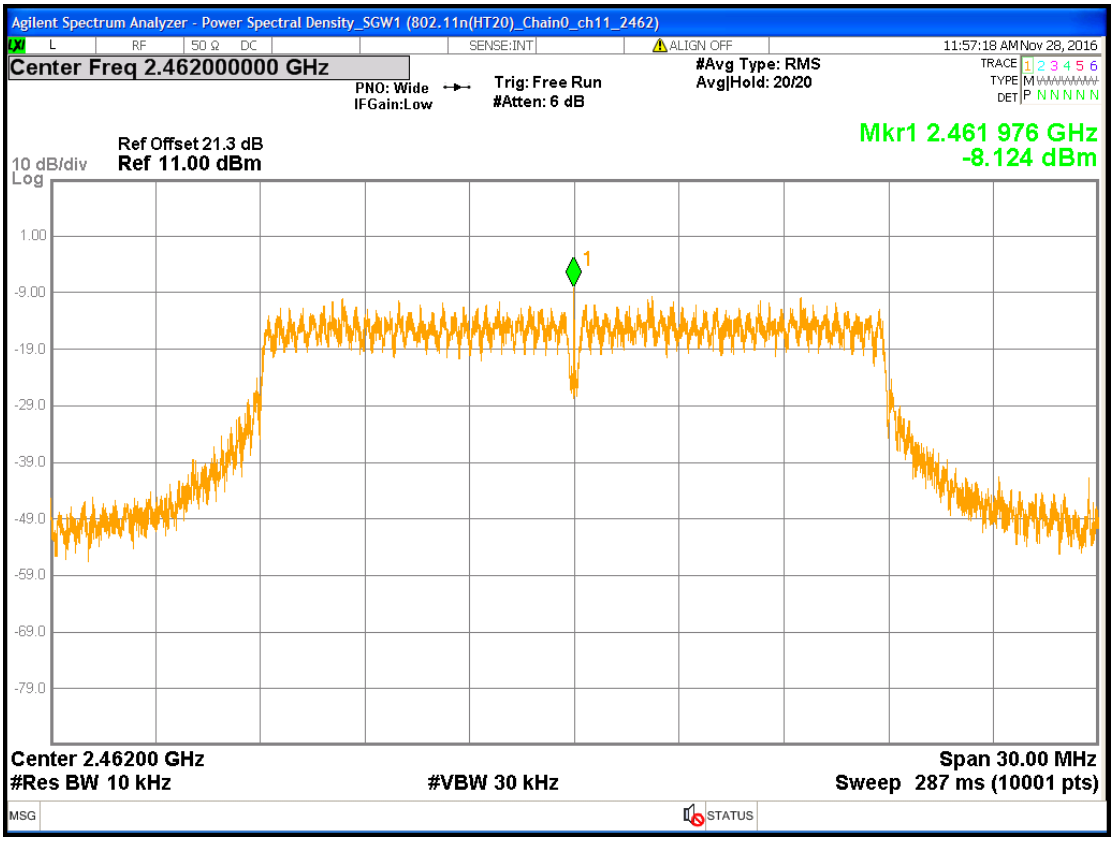
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch1



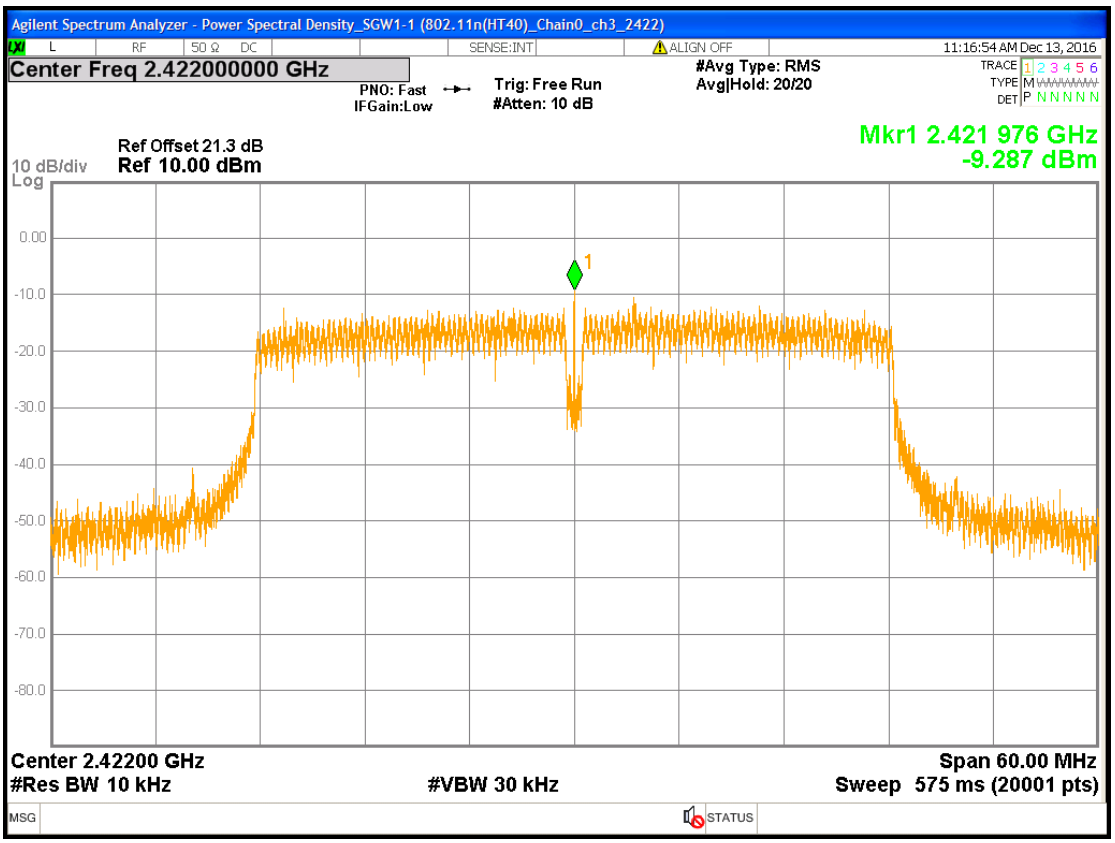
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch6



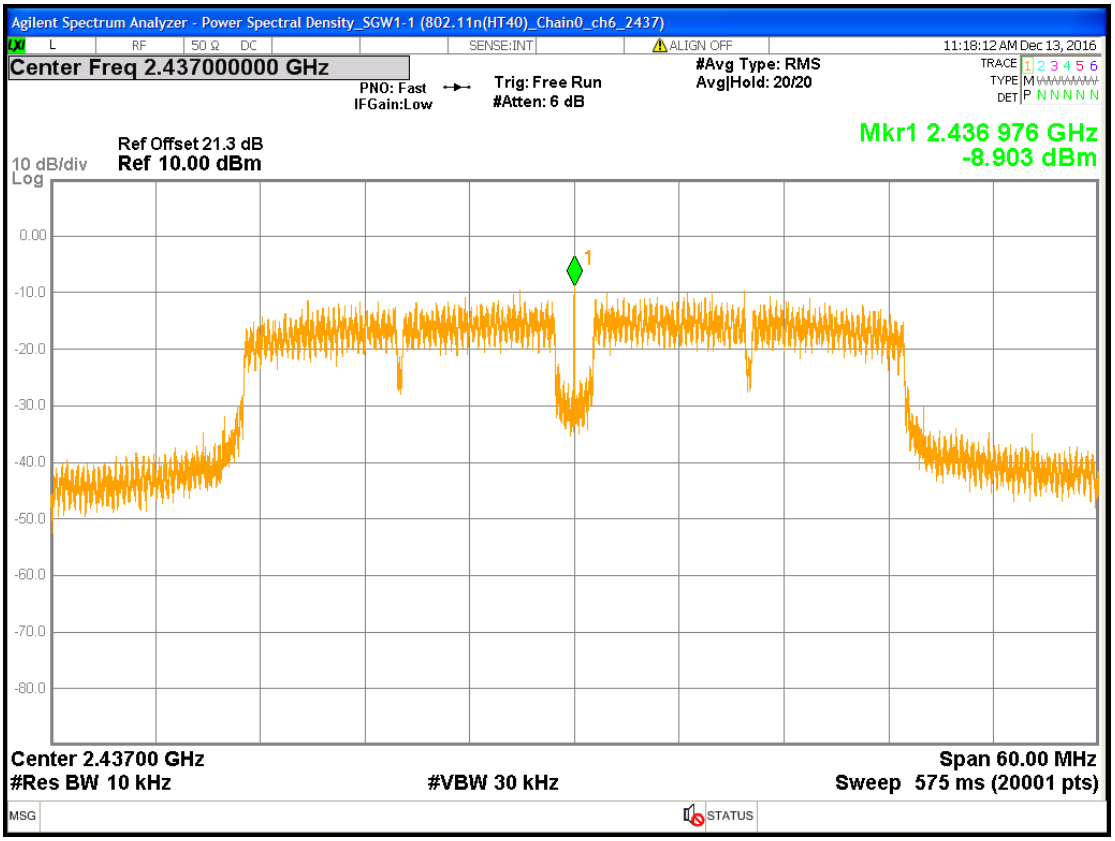
Chain0 : Power Spectral Density @ 802.11n(HT20) mode ch11



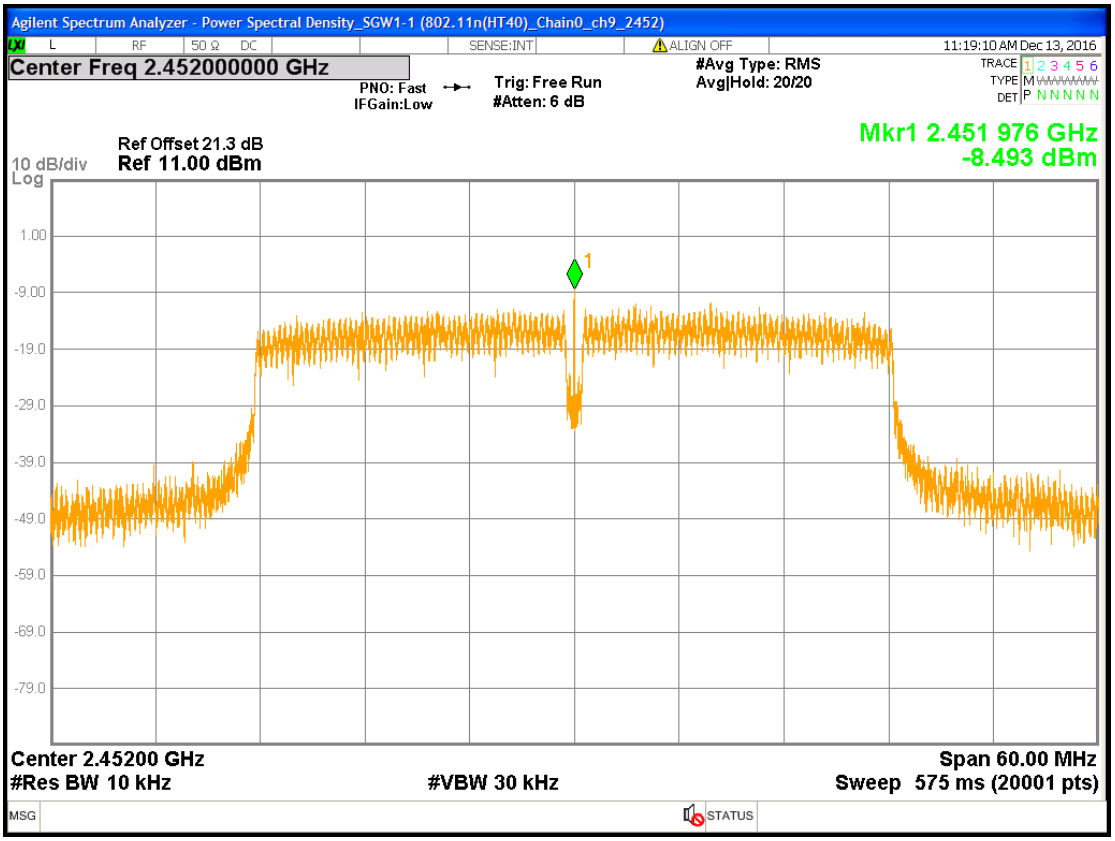
Chain0 : Power Spectral Density @ 802.11n(HT40) mode ch3



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



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



6. Emissions In Non-Restricted Frequency Bands

6.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement	15.247(d)	
Channel number	Low、Middle、High	

6.2 Limit for emissions in non-restricted frequency bands

The peak output power 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

6.3 Measuring instruments setting

Reference level measurement

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	≧100 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Max hold
Span	≧1.5 time 6dB bandwidth
Attenuation	Auto

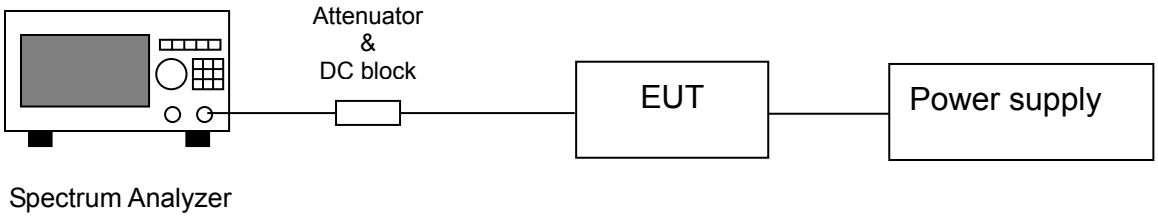
Emission level measurement

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	≧100 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Trace	Max hold
Attenuation	Auto

6.4 Test procedure

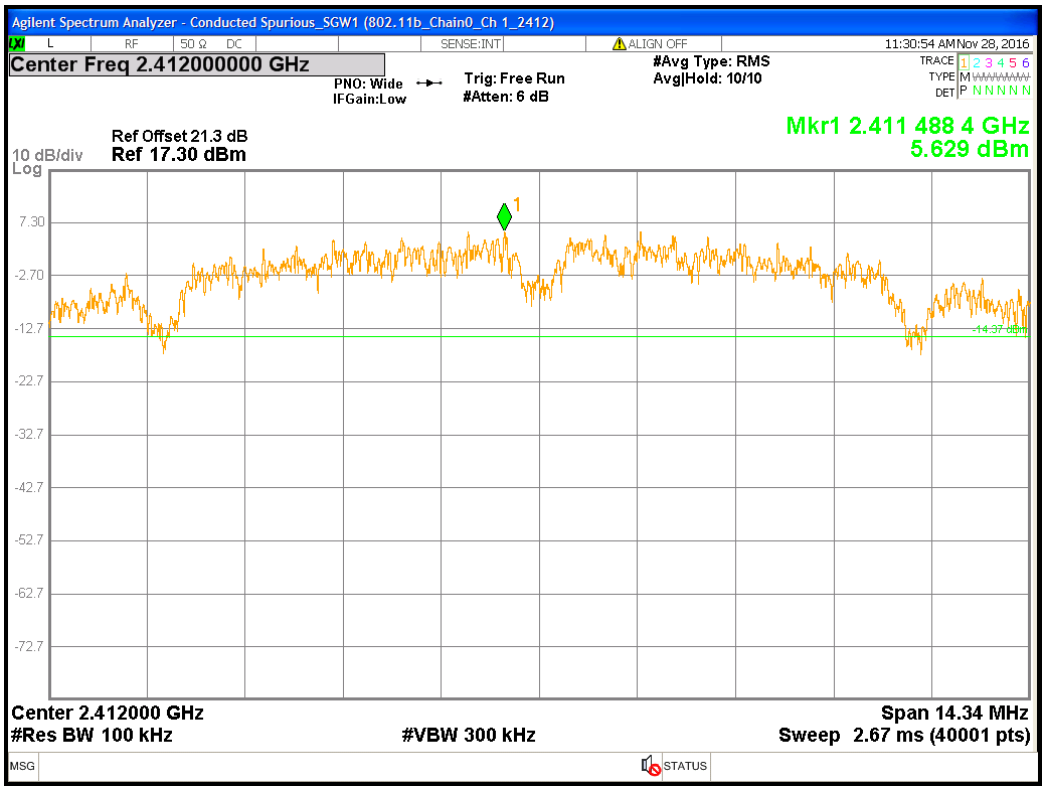
1. The procedure was used in antenna-port conducted and connected to the spectrum analyzer.
2. Set instrument center frequency to center frequency
3. Use the parameter configured in clause 6.3 to measure
4. Use the peak marker function to determine the maximum amplitude level.

6.5 Test diagram

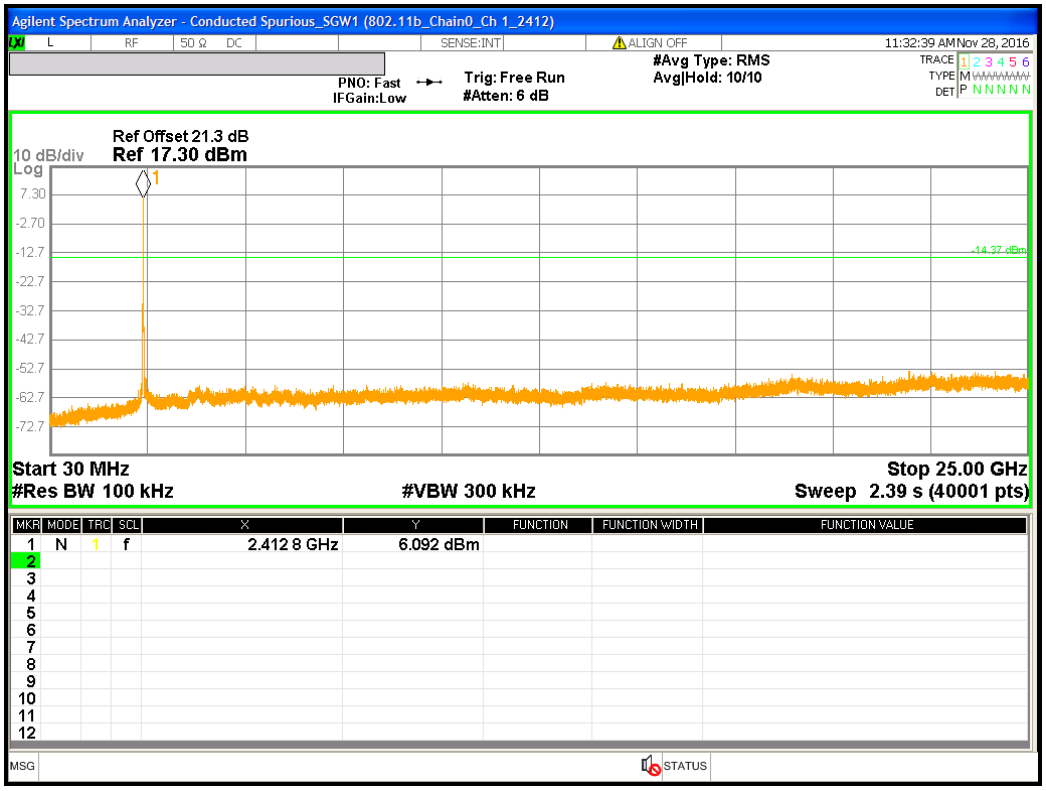


6.6 Test results

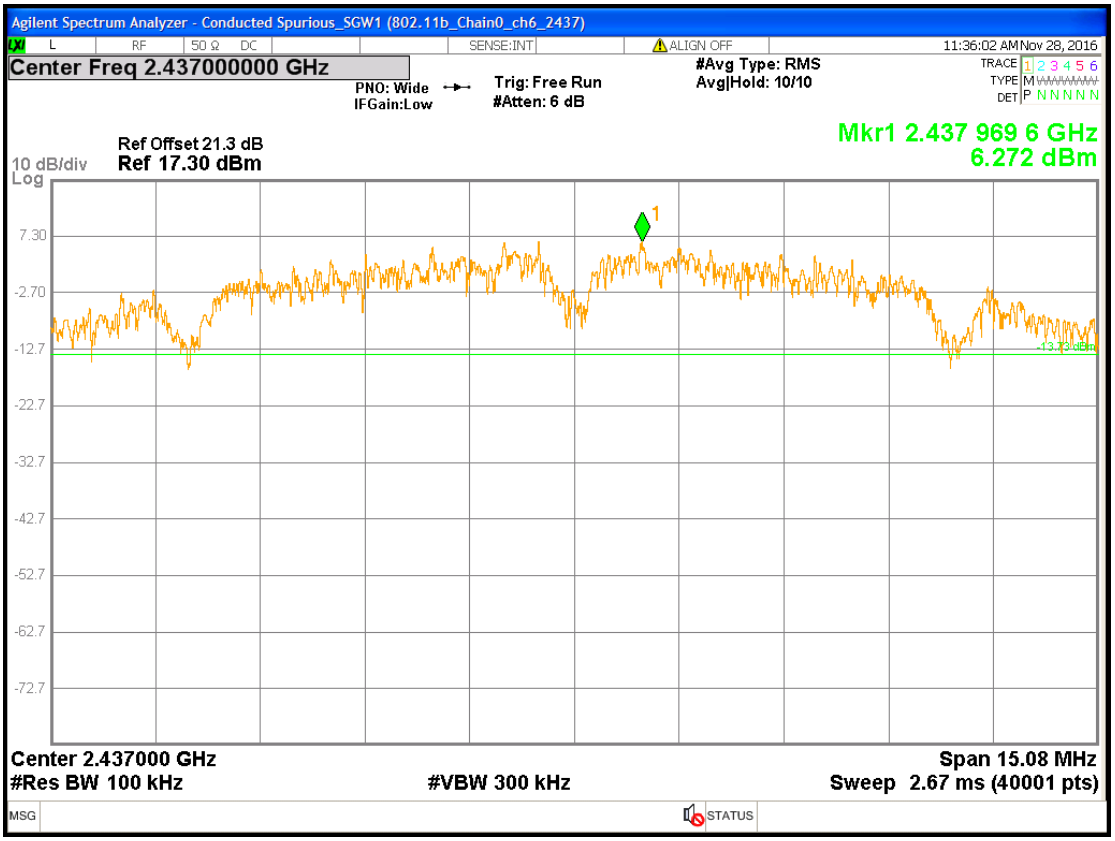
Chain0 : Conducted Spurious @ 802.11b mode Ch 1



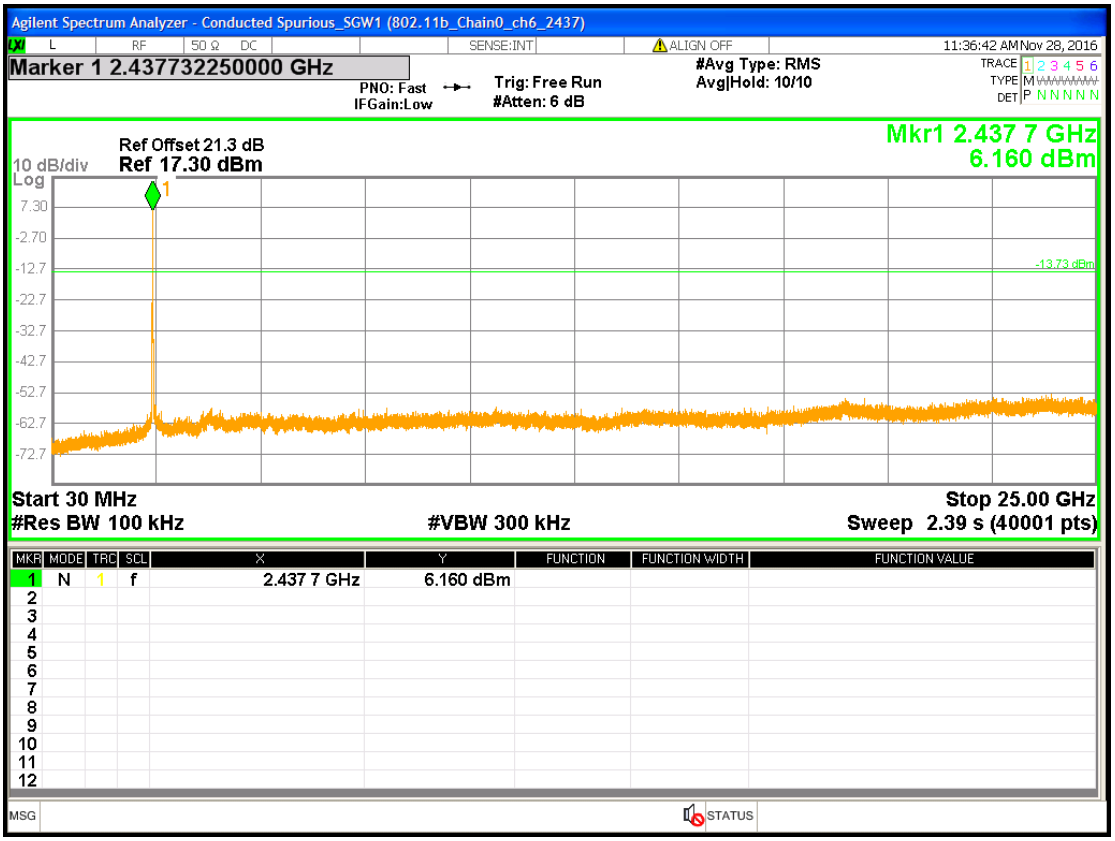
Chain0 : Conducted Spurious @ 802.11b mode Ch 1



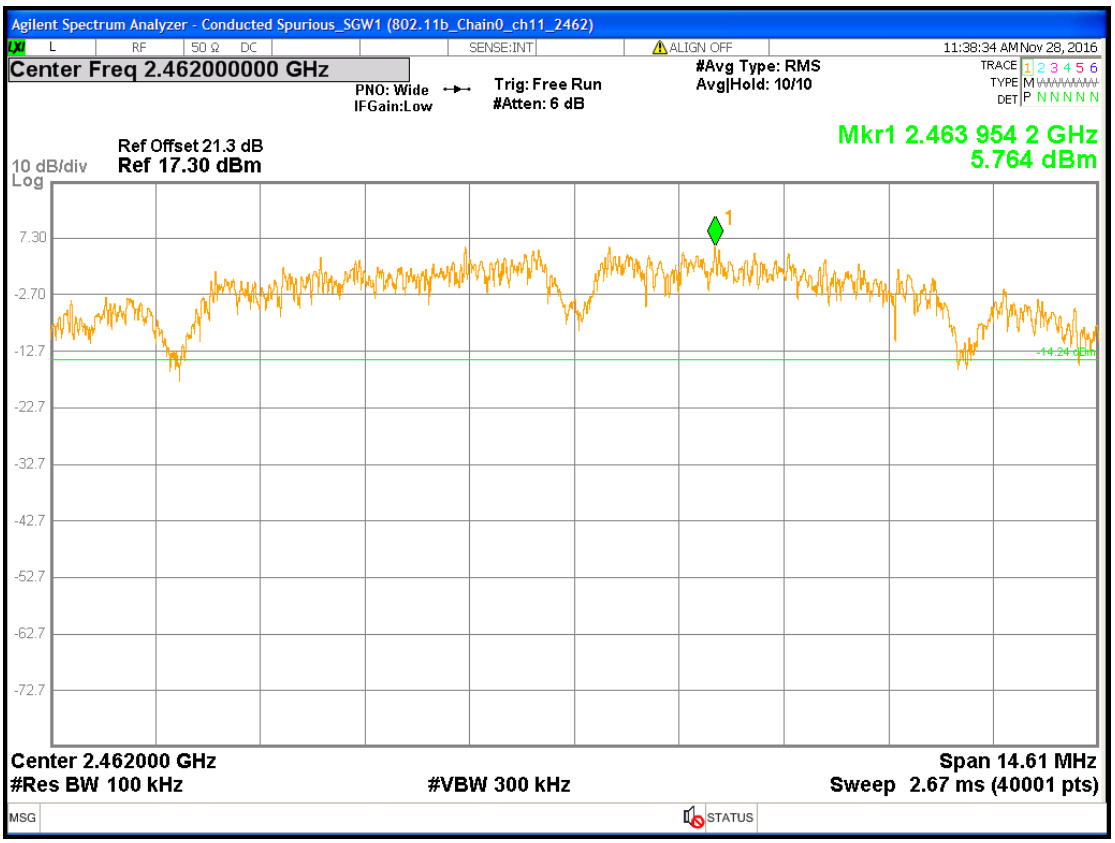
Chain0 : Conducted Spurious @ 802.11b mode ch6



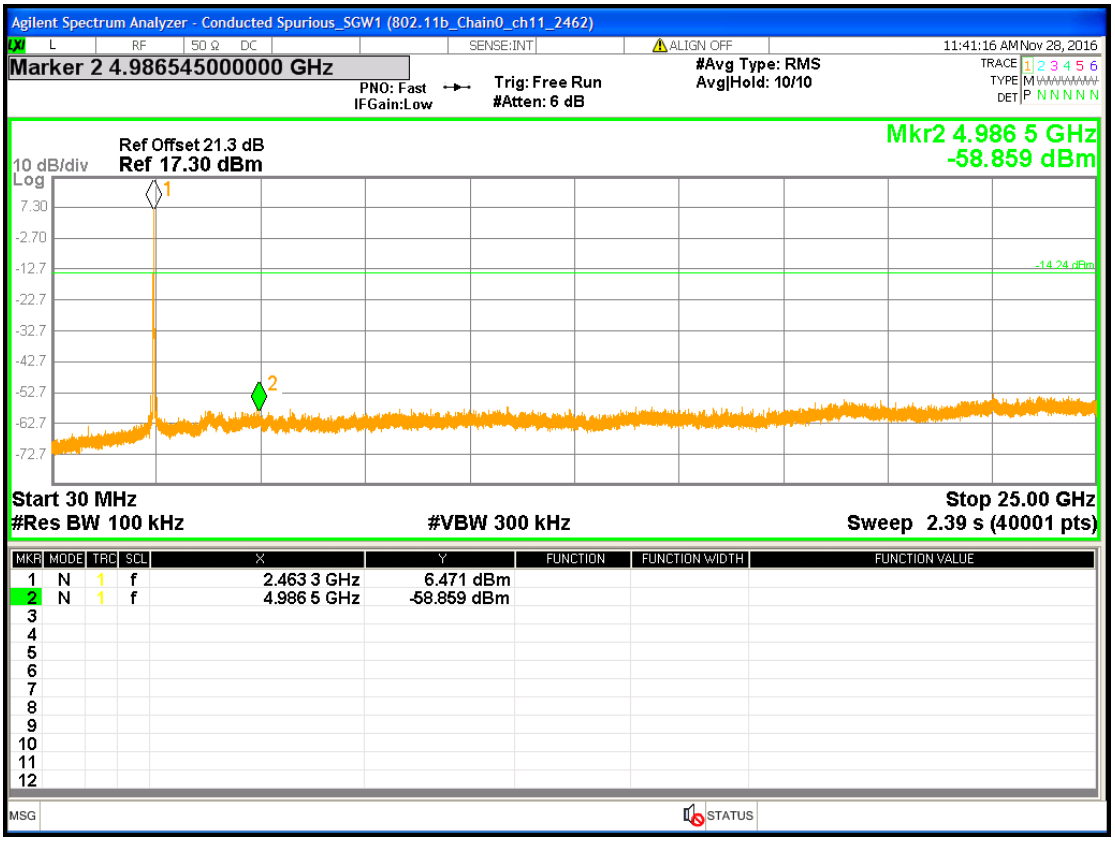
Chain0 : Conducted Spurious @ 802.11b mode ch6



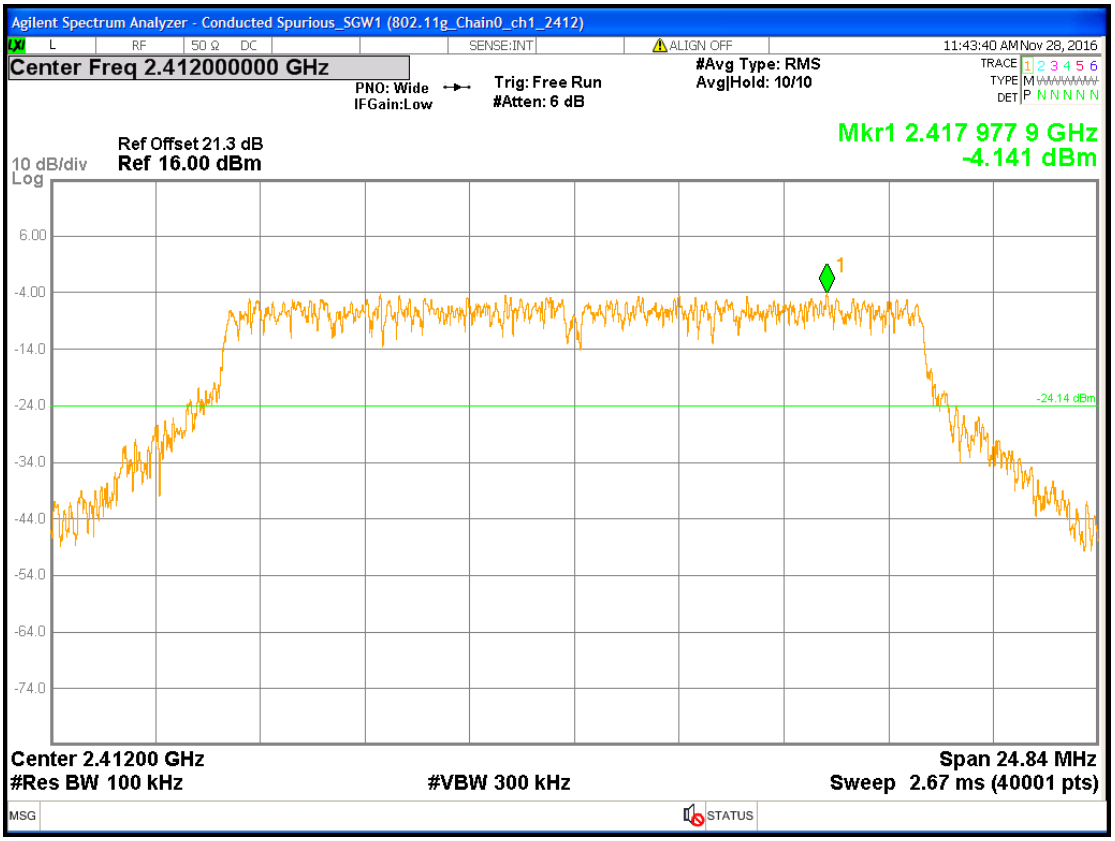
Chain0 : Conducted Spurious @ 802.11b mode ch11



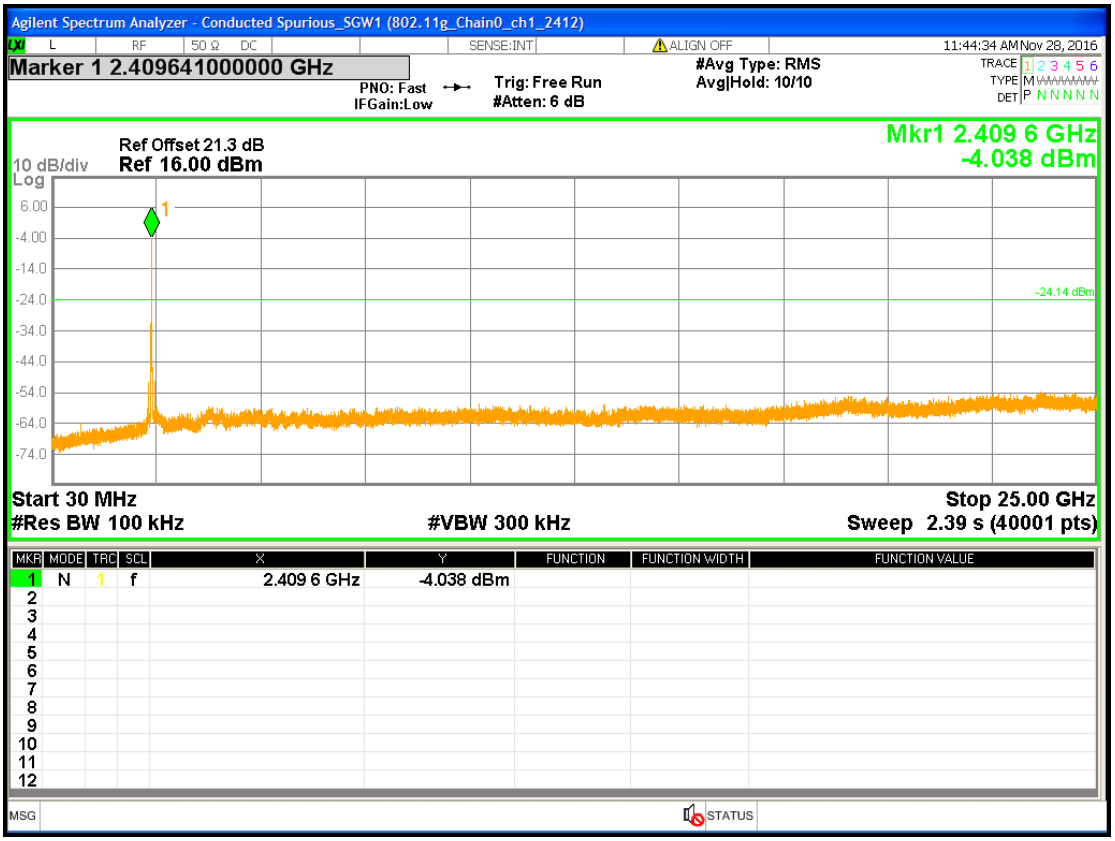
Chain0 : Conducted Spurious @ 802.11b mode ch11



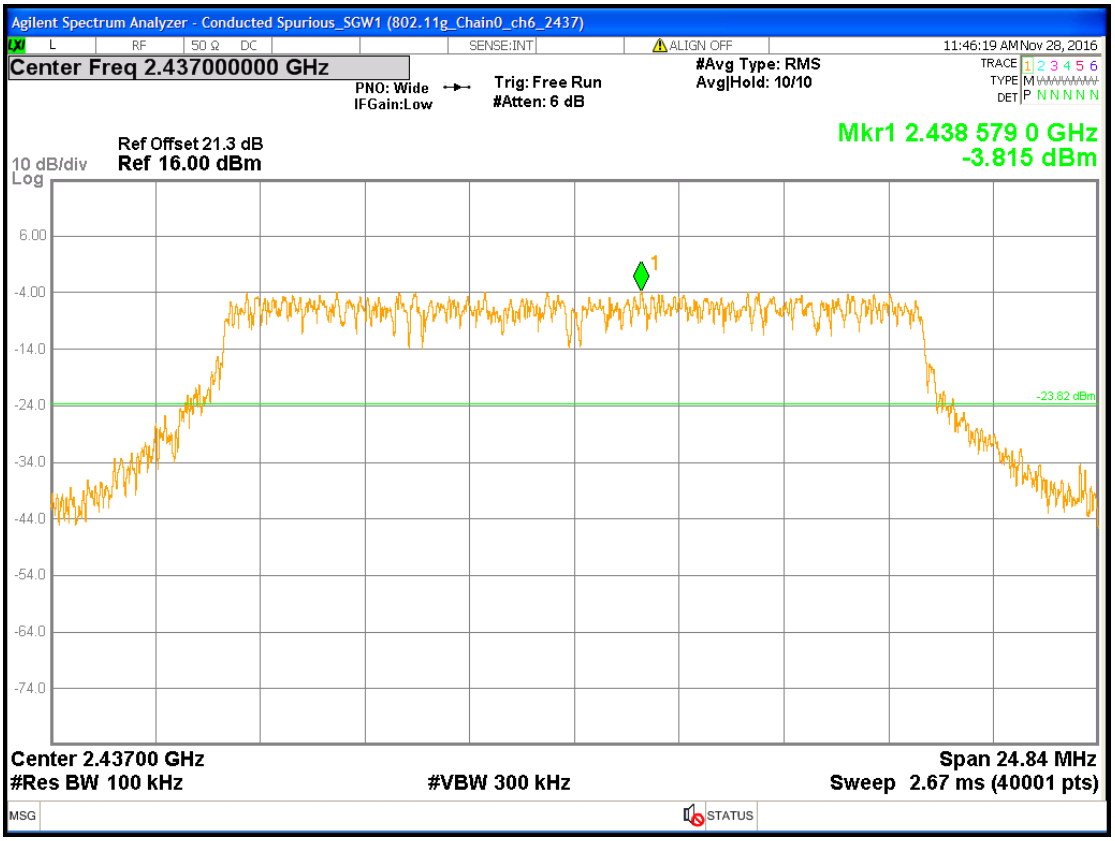
Chain0 : Conducted Spurious @ 802.11g mode ch1



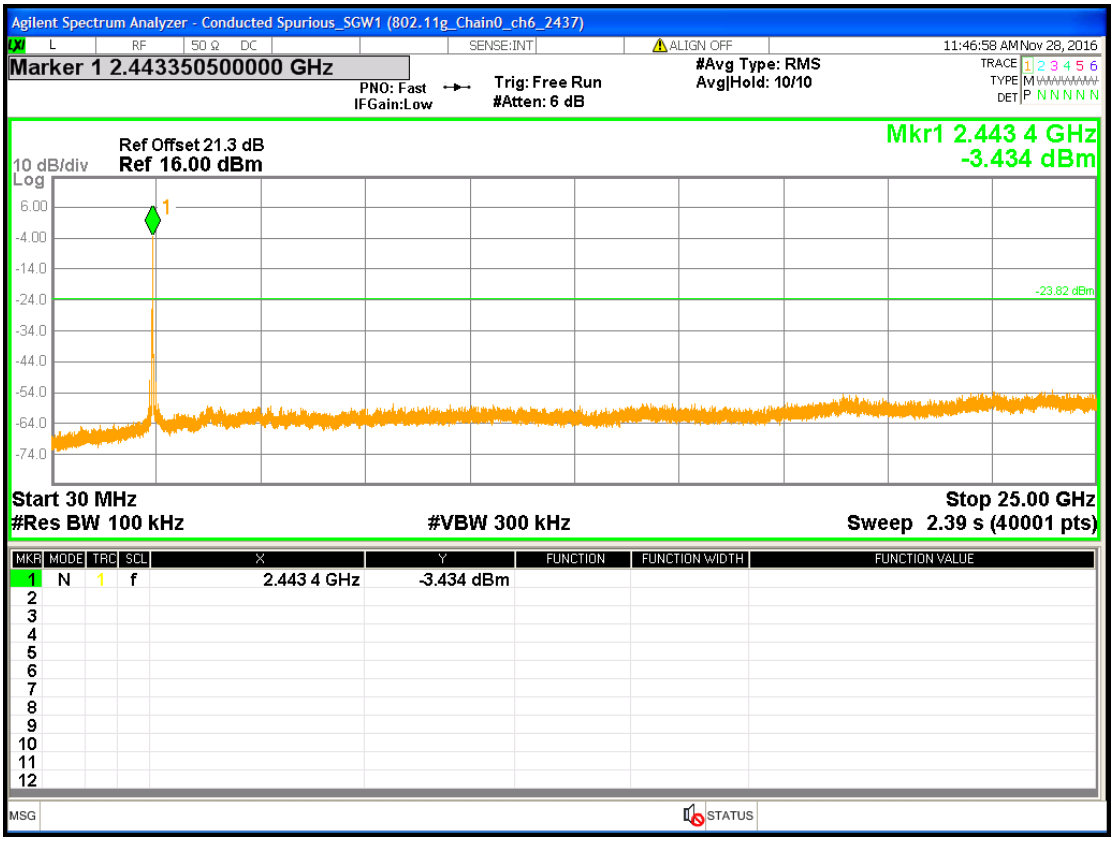
Chain0 : Conducted Spurious @ 802.11g mode ch1



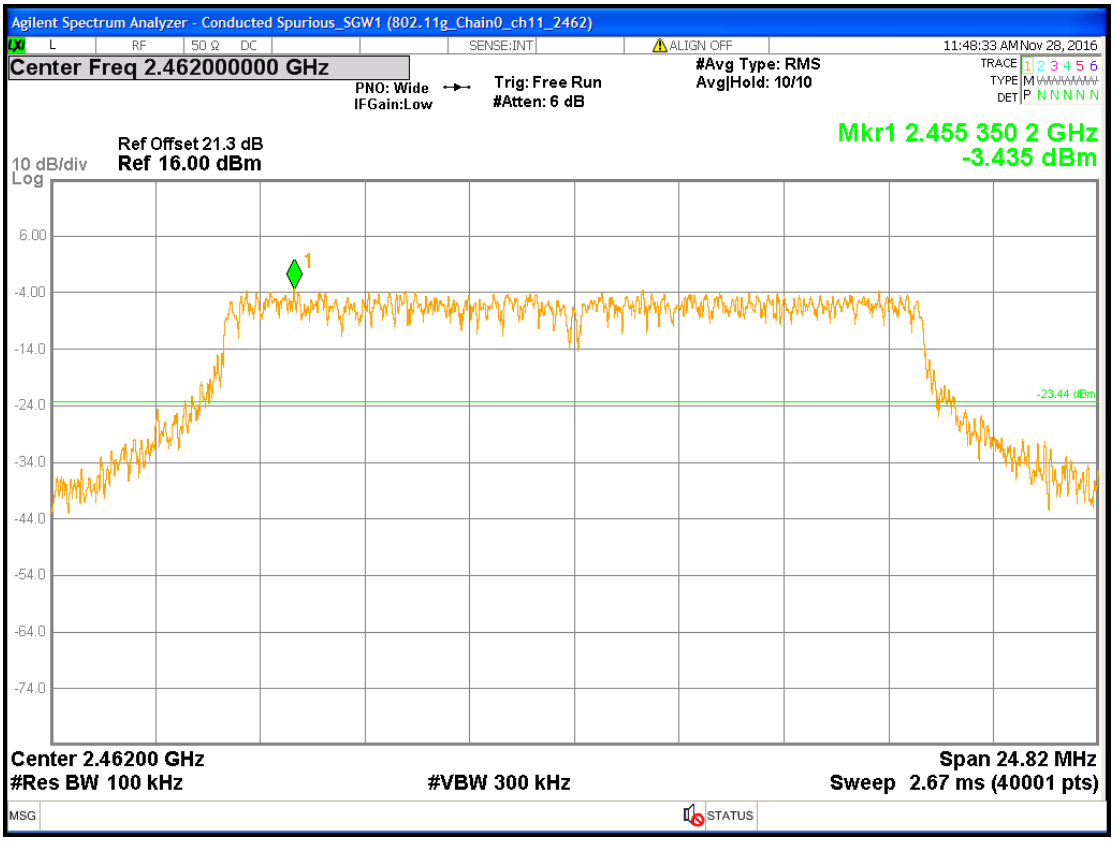
Chain0 : Conducted Spurious @ 802.11g mode ch6



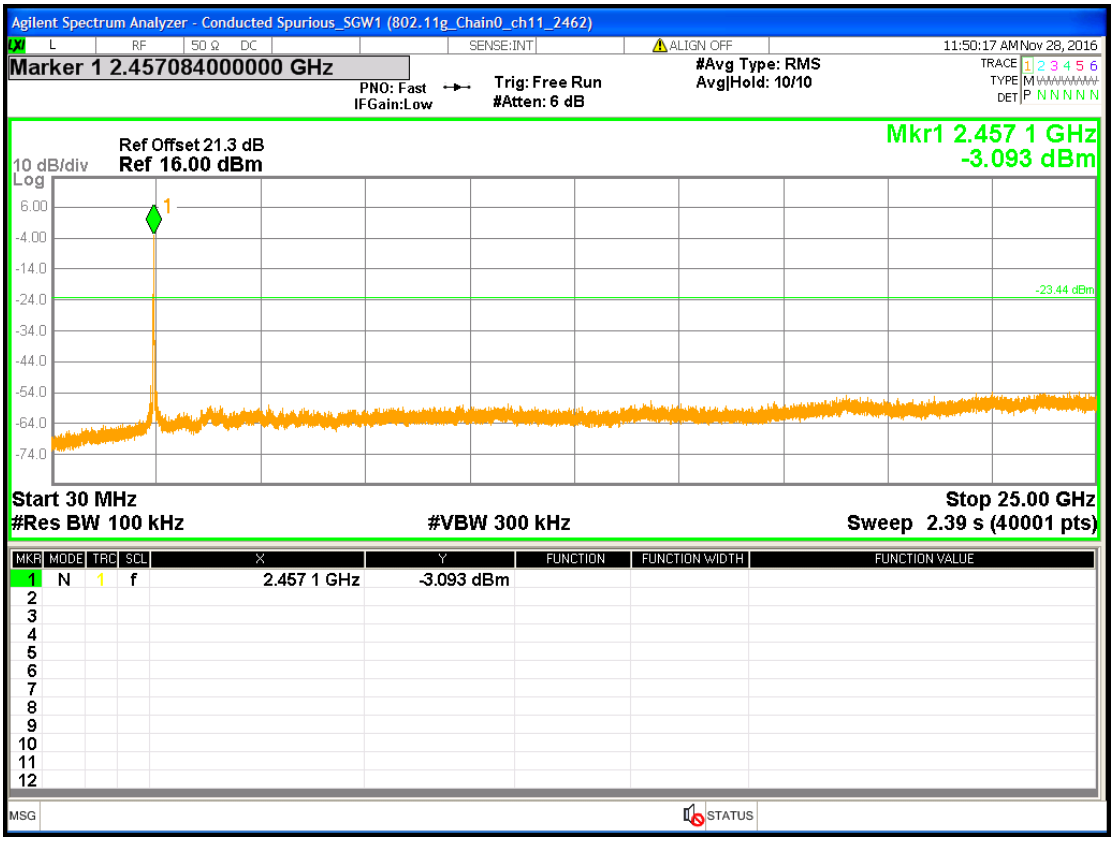
Chain0 : Conducted Spurious @ 802.11g mode ch6



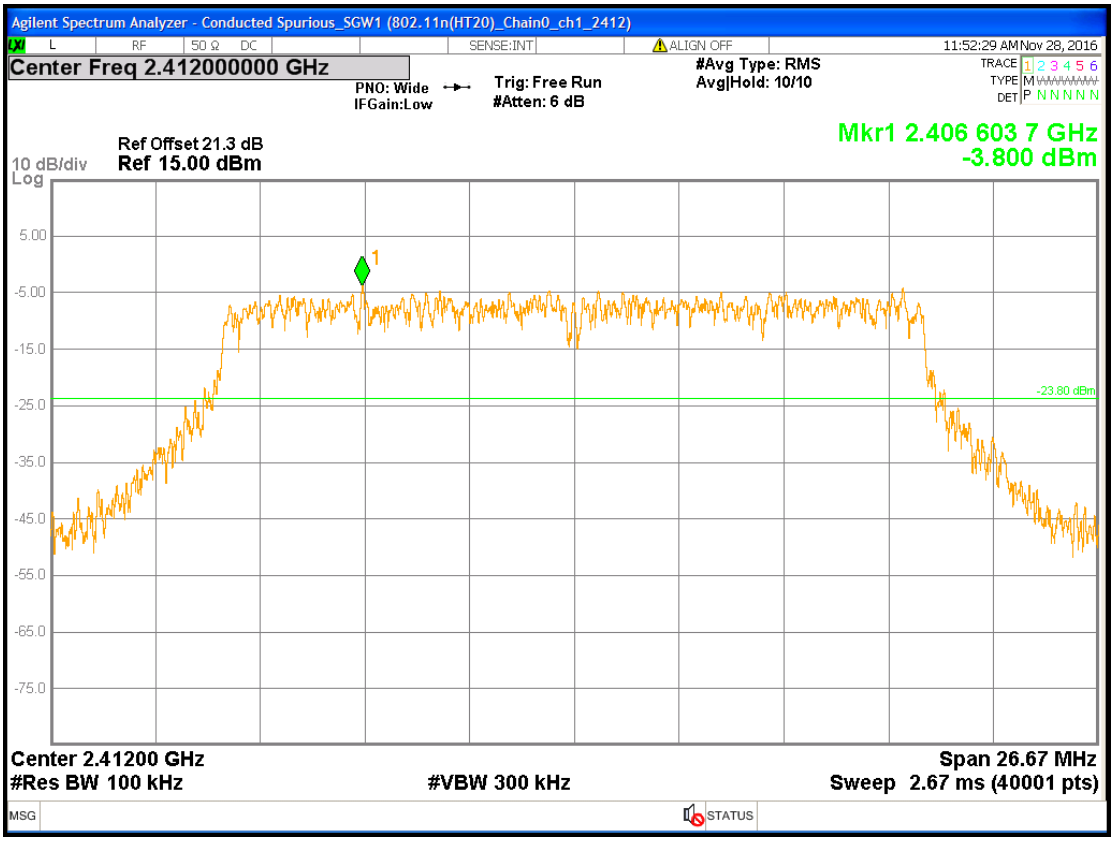
Chain0 : Conducted Spurious @ 802.11g mode ch11



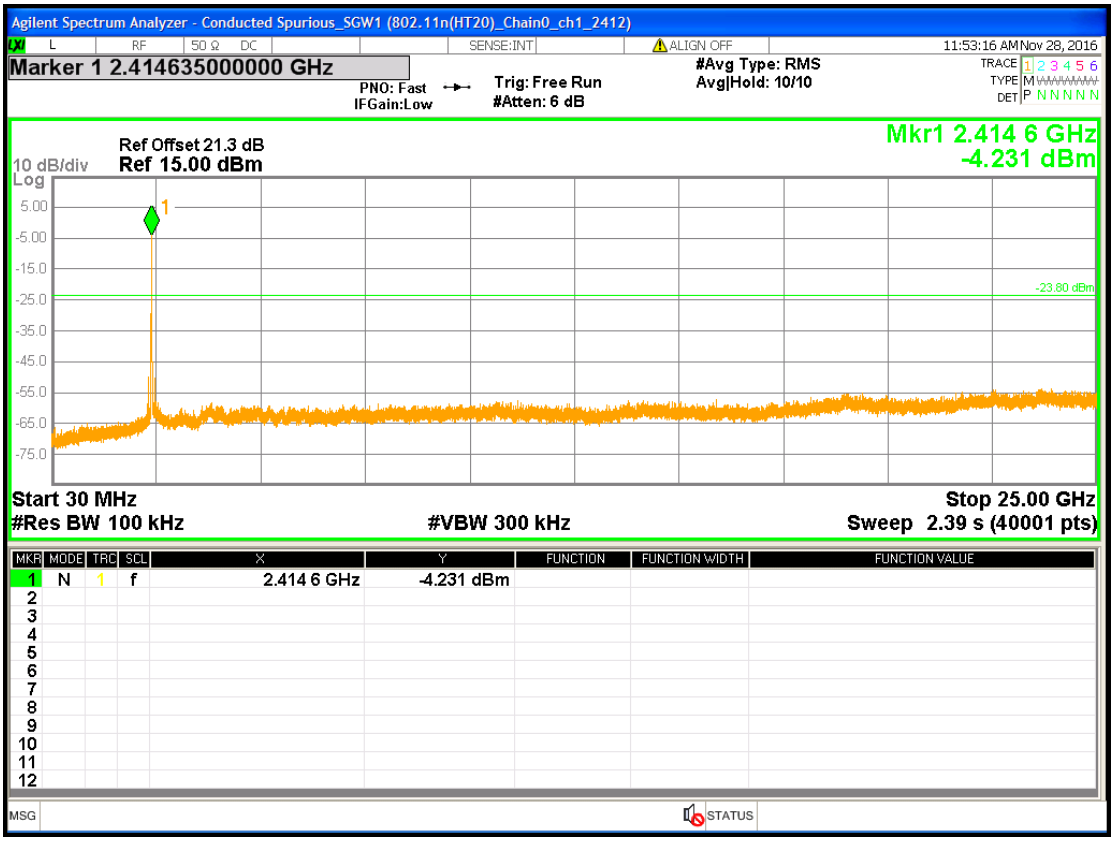
Chain0 : Conducted Spurious @ 802.11g mode ch11



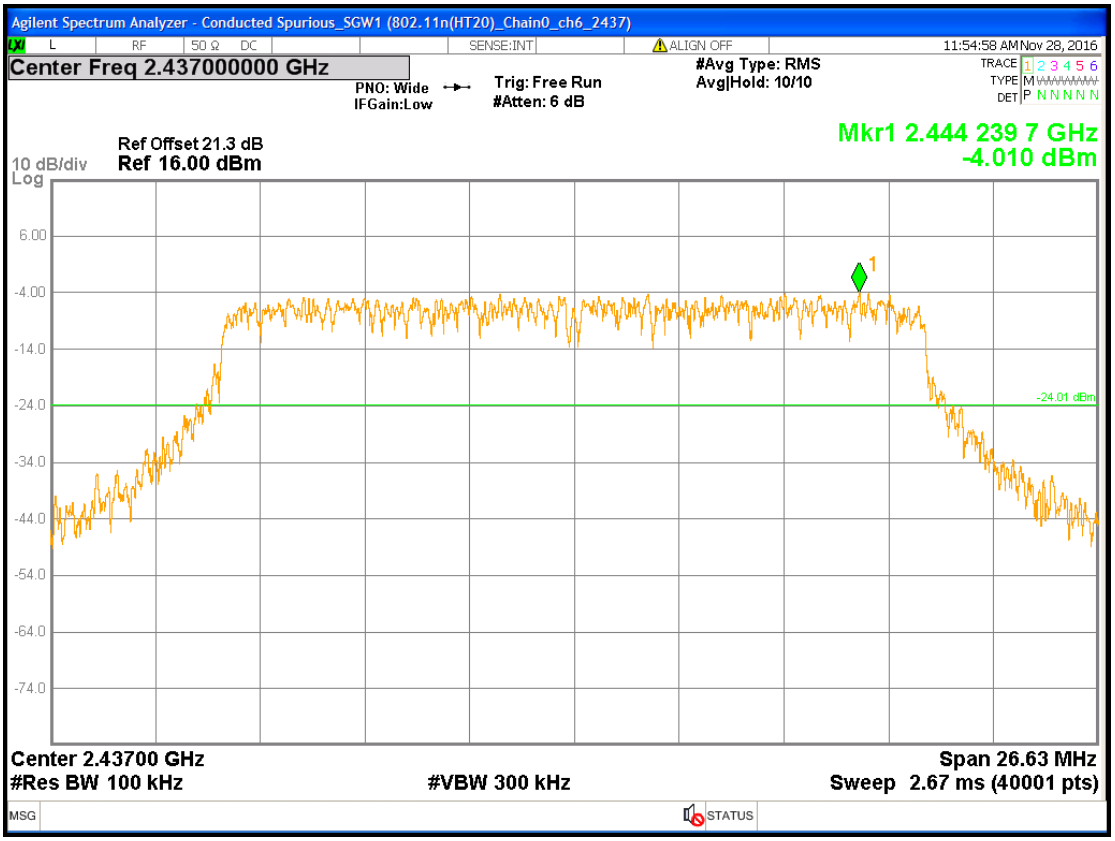
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch1



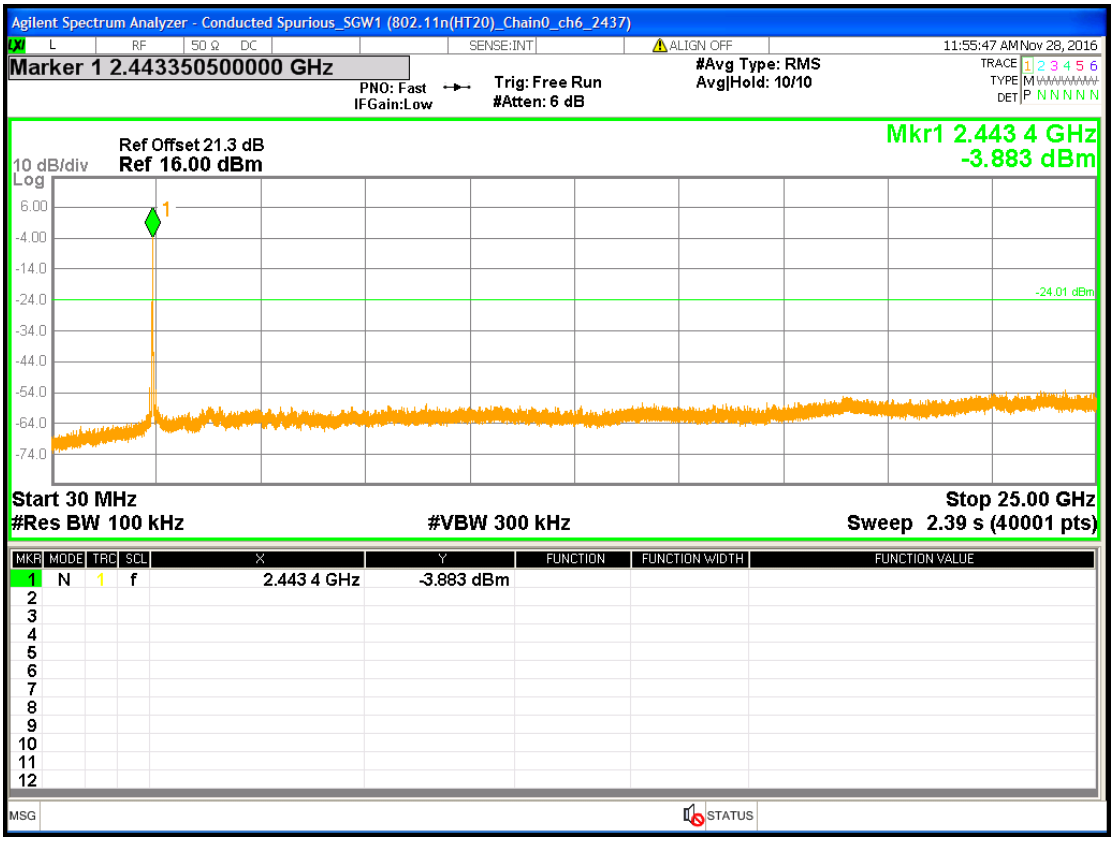
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch1



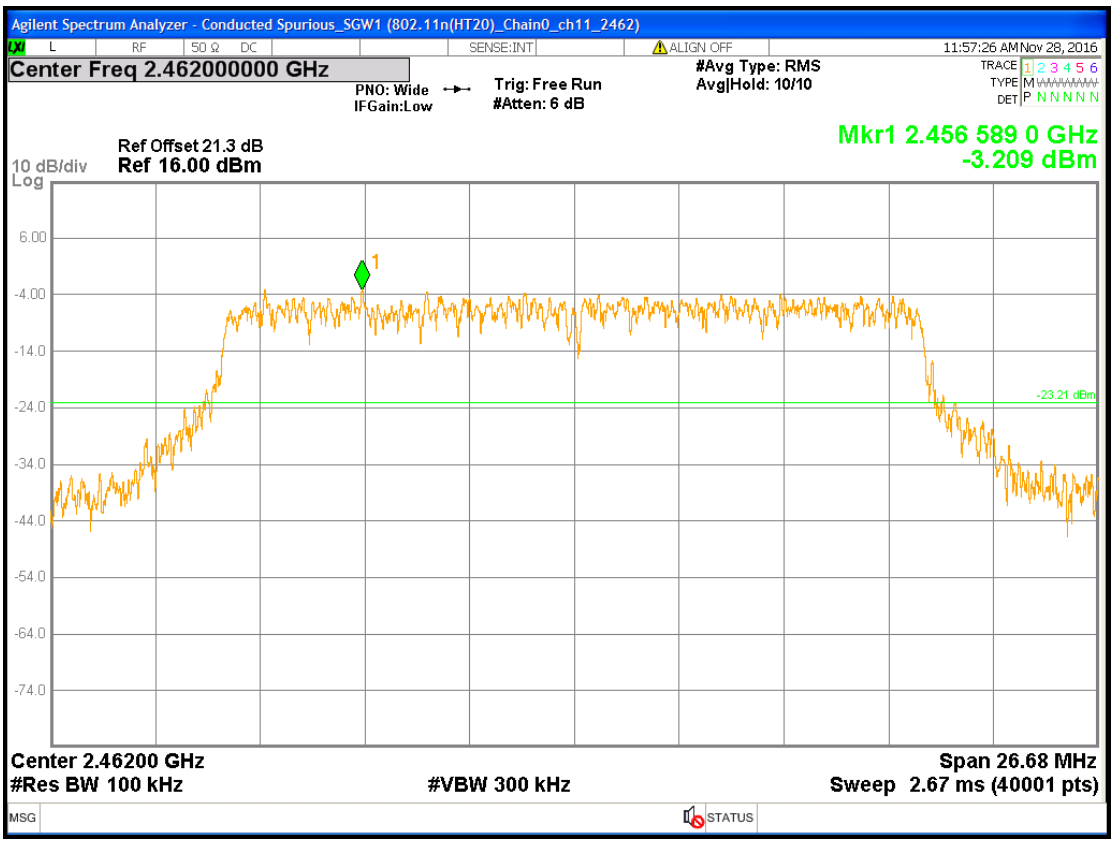
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch6



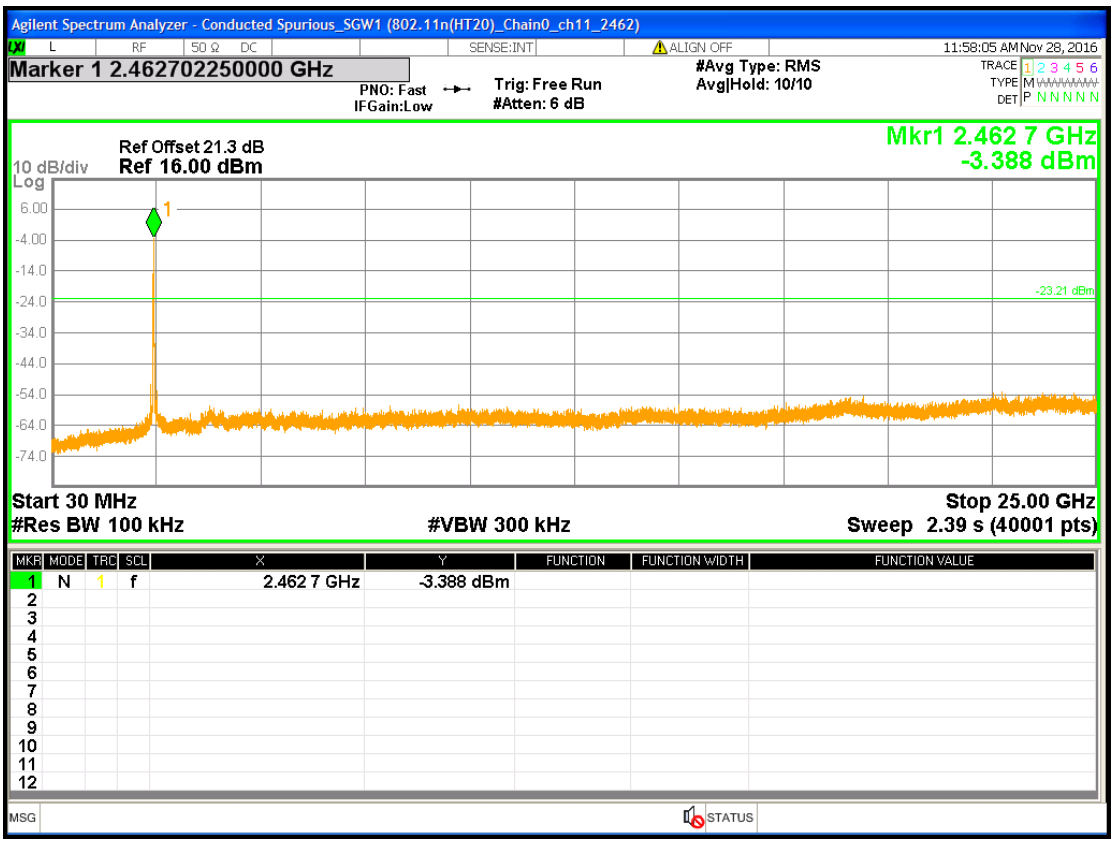
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch6



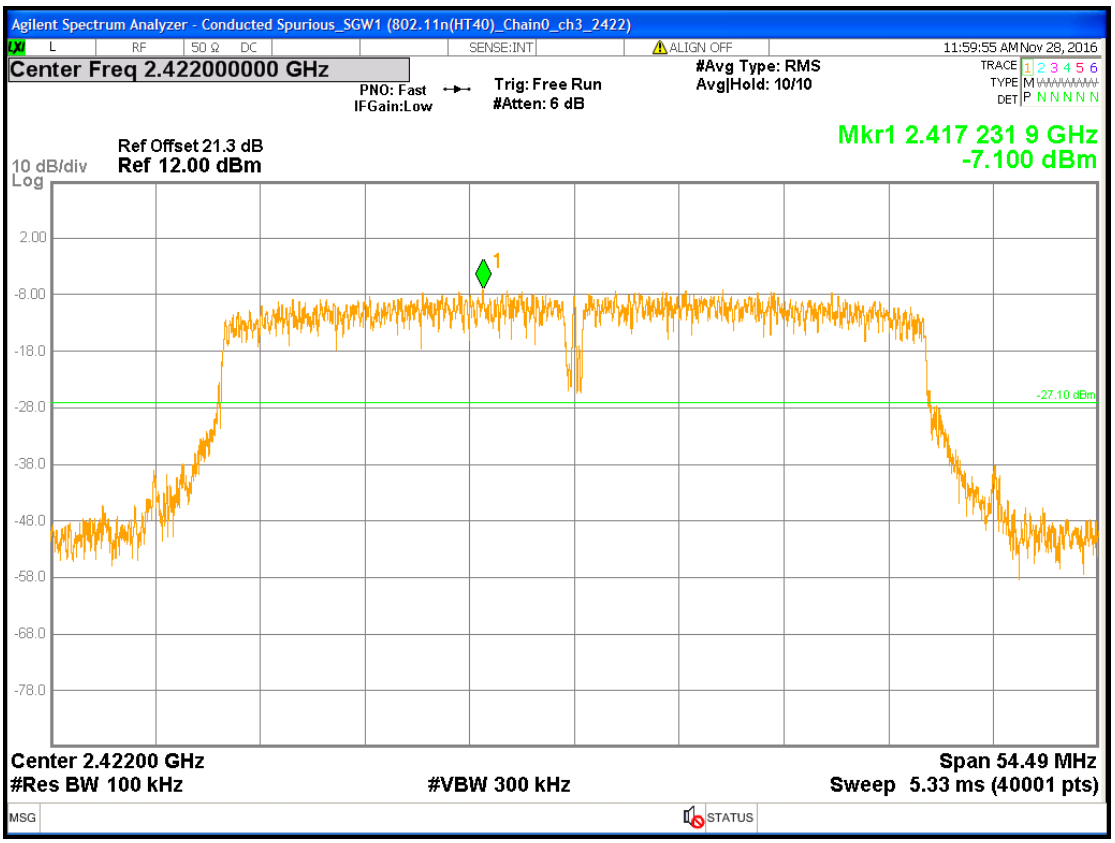
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch11



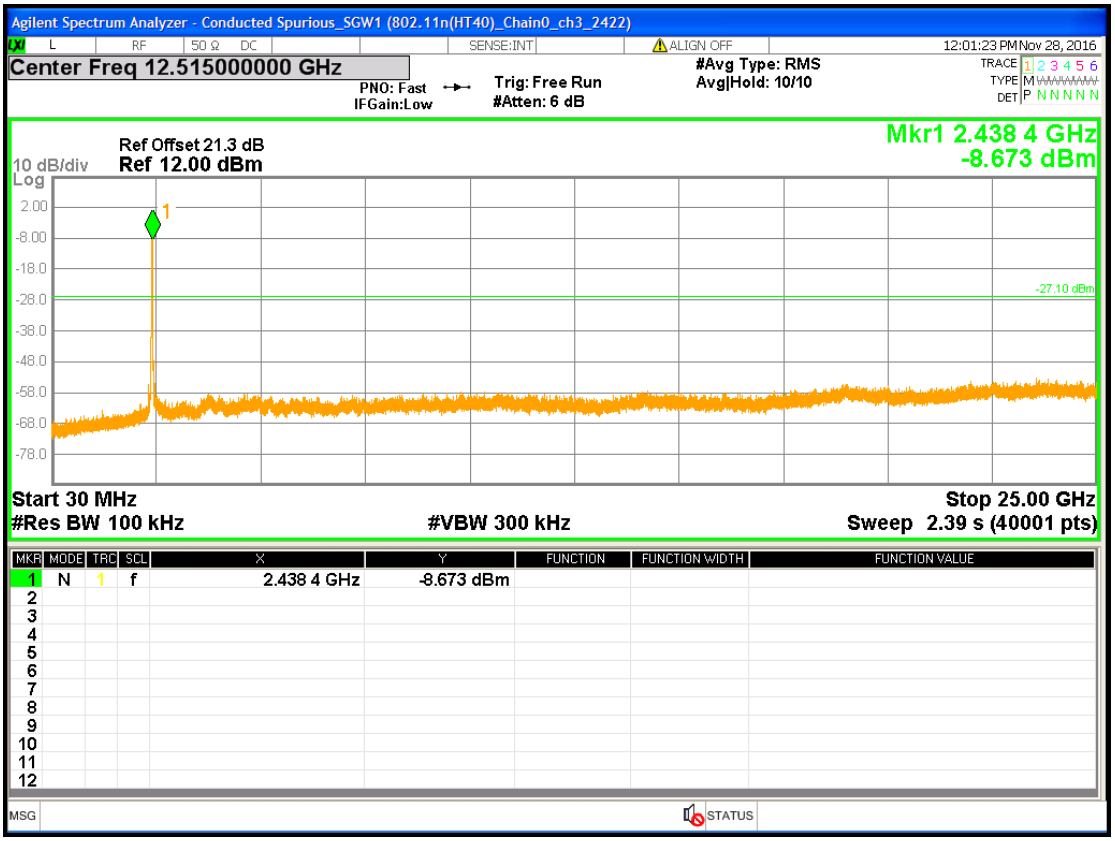
Chain0 : Conducted Spurious @ 802.11n(HT20) mode ch11



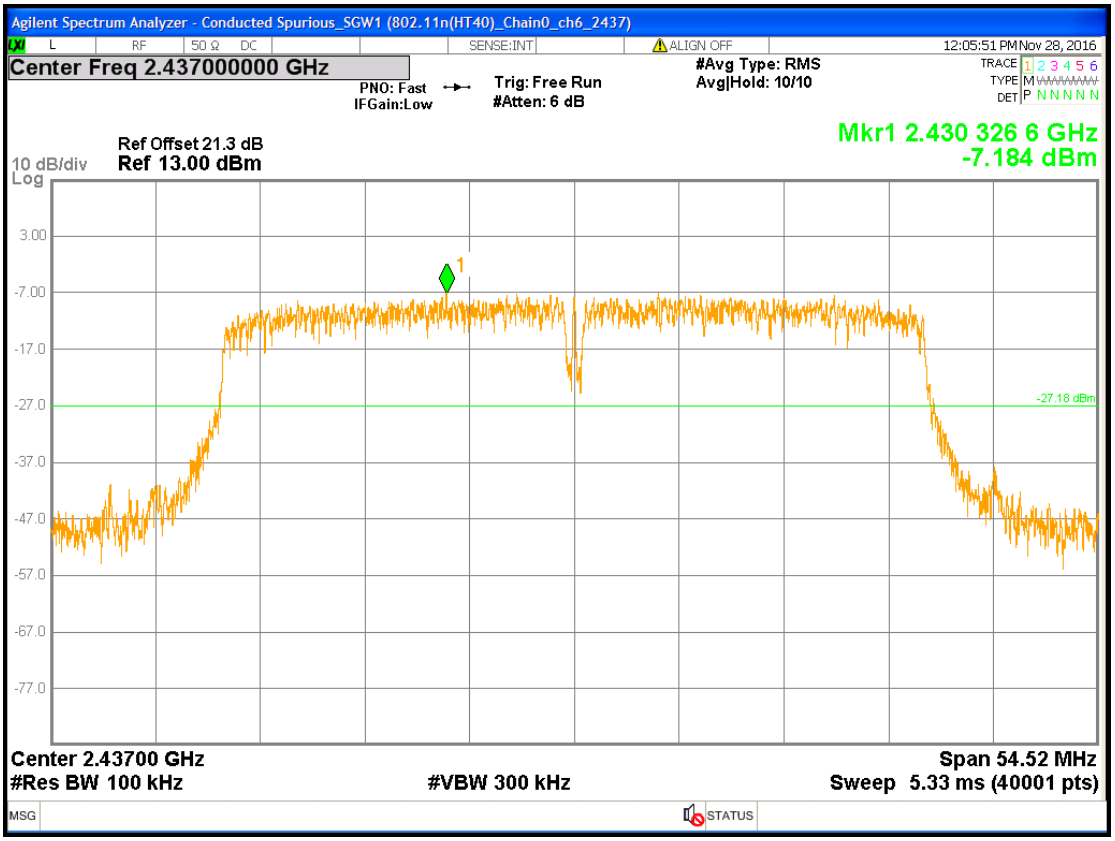
Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch3



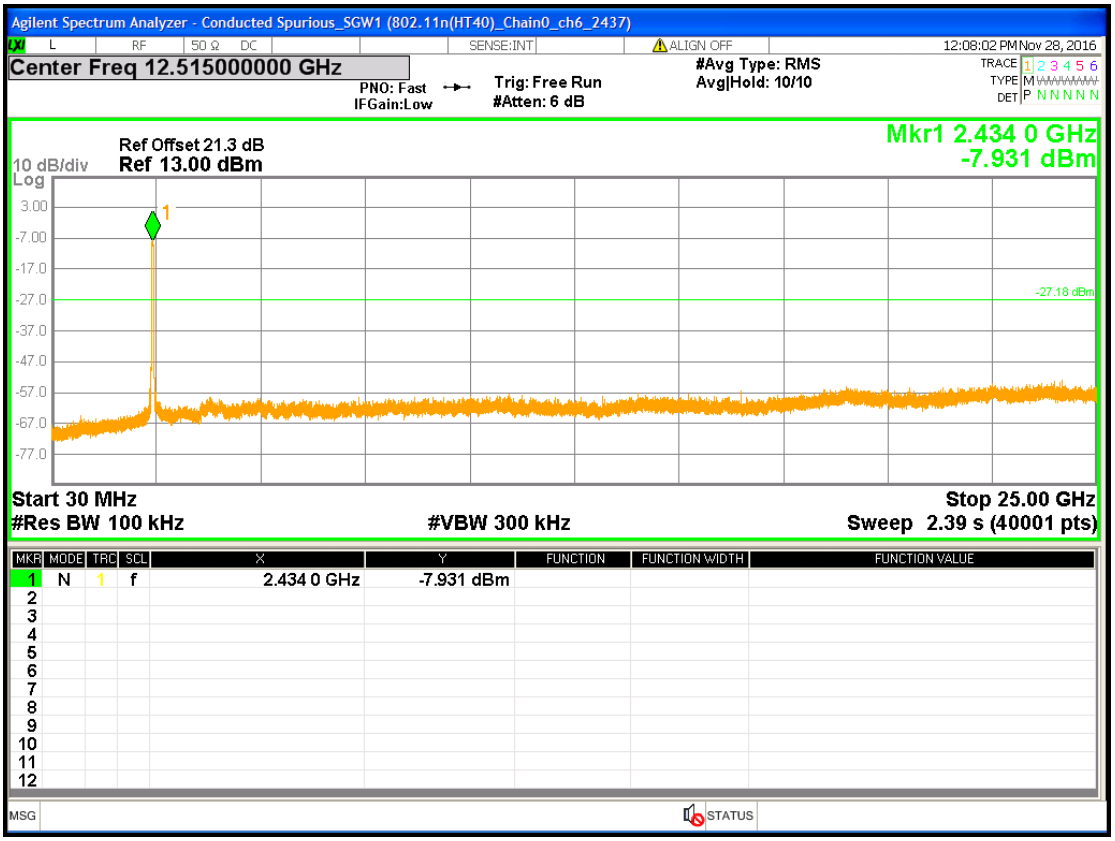
Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch3



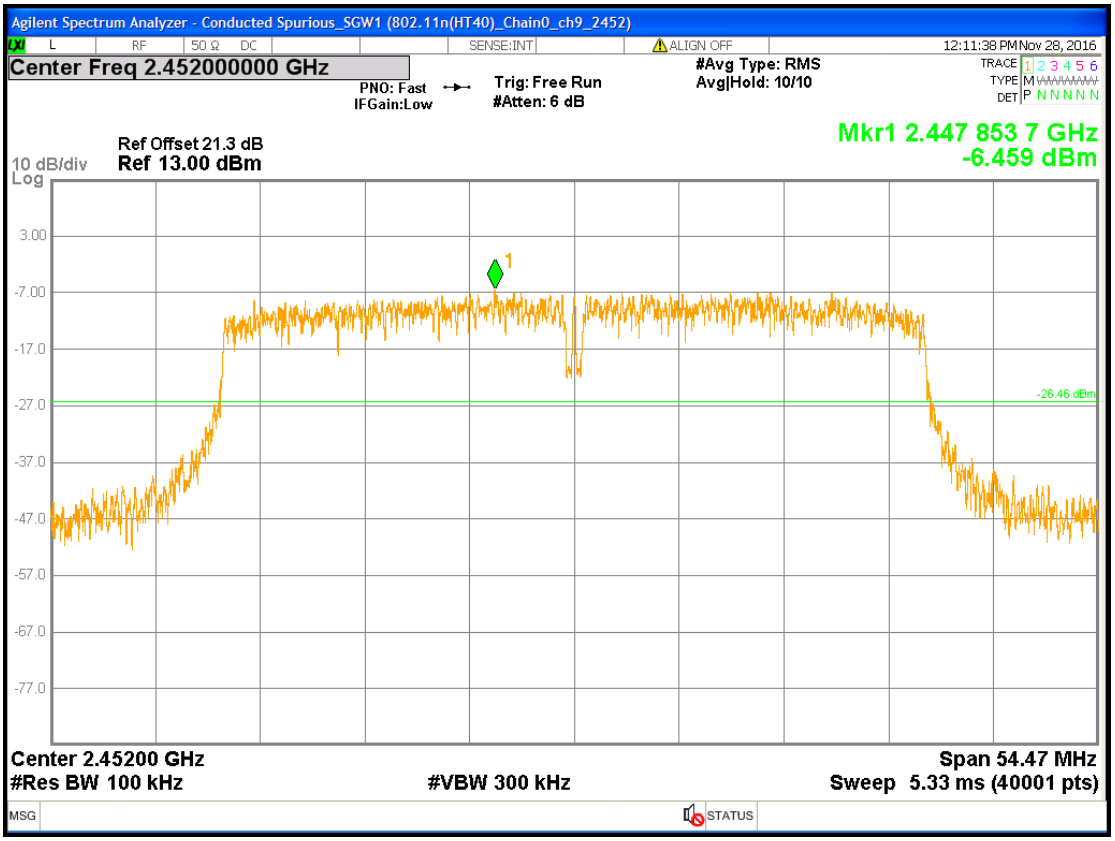
Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch6



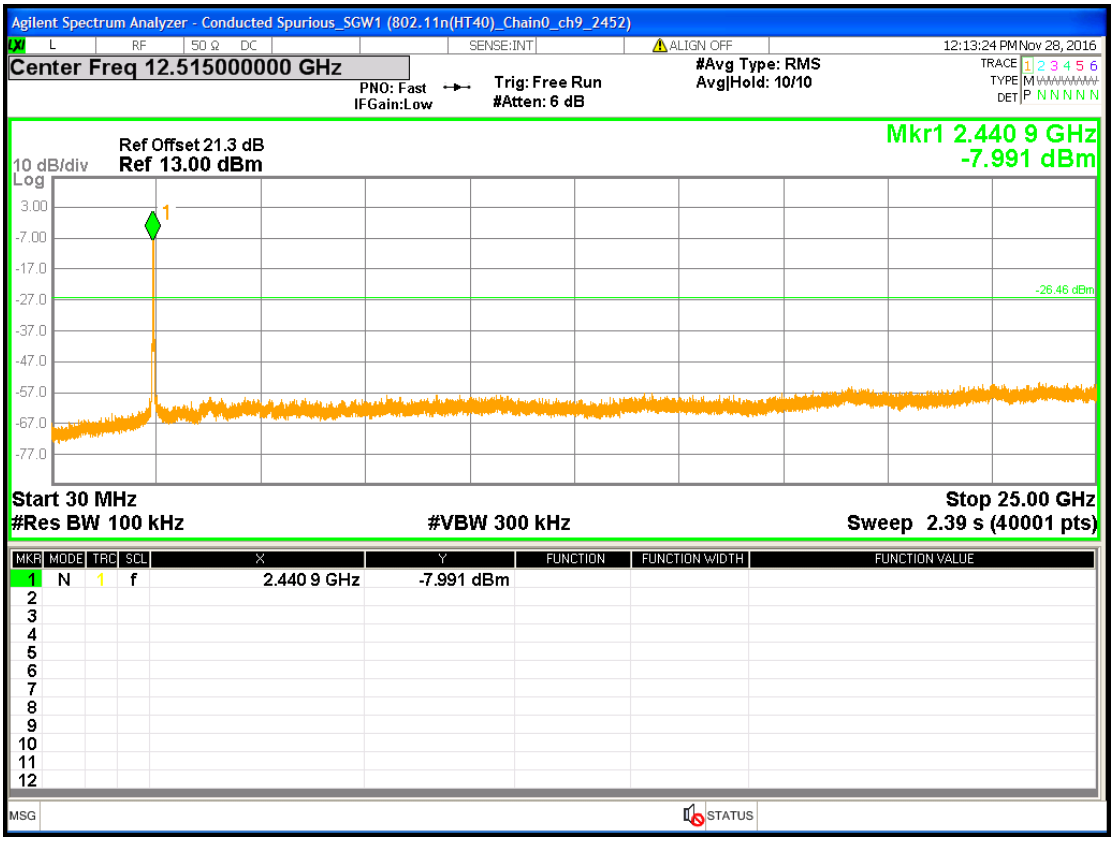
Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch6



Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch9



Chain0 : Conducted Spurious @ 802.11n(HT40) mode ch9



7. Emissions In Restricted Frequency Bands (Radiated emission measurements)

7.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement	15.247(d), 15.205, 15.209	

7.2 Limit for emission in restricted frequency bands (Radiated emission measurement)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	2400/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

7.3 Measuring instrument setting

Below 1GHz measurement

Receiver settings	
Receiver function	**Setting**
Detector	QP
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz
VBW	≧3 x RBW
Sweep	Auto couple
Attenuation	Auto

Above 1GHz measurement

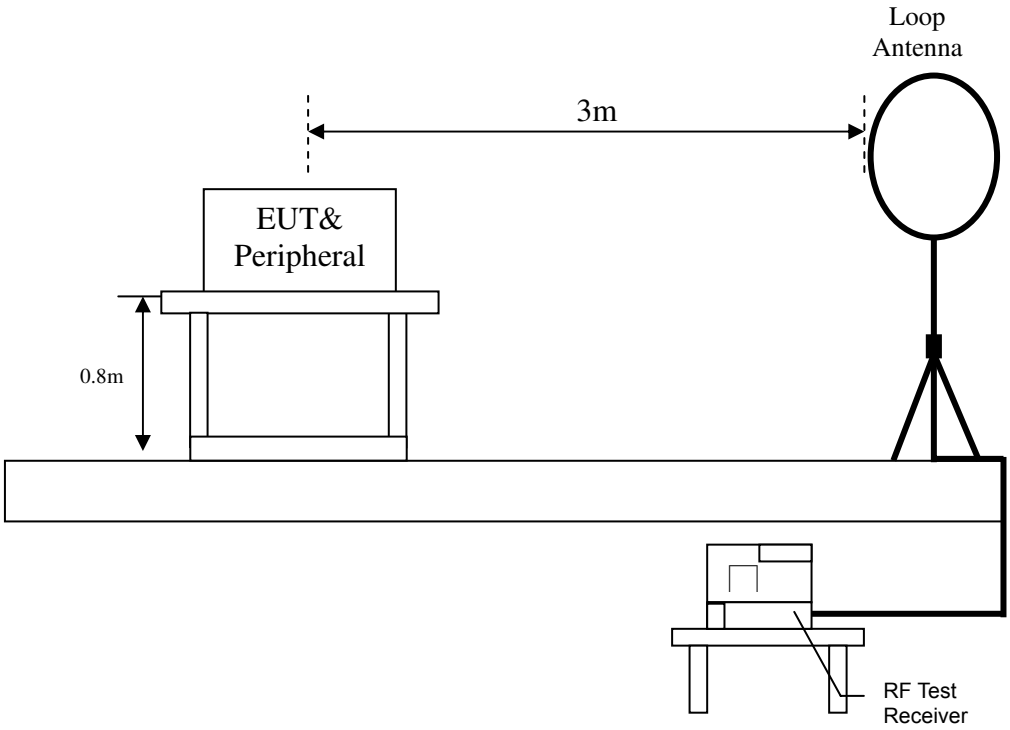
Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	1MHz
VBW	3MHz for Peak and Average
Sweep	Auto couple
Start Frequency	1GHz
Stop Frequency	Tenth harmonic
Attenuation	Auto

7.4 Test procedure

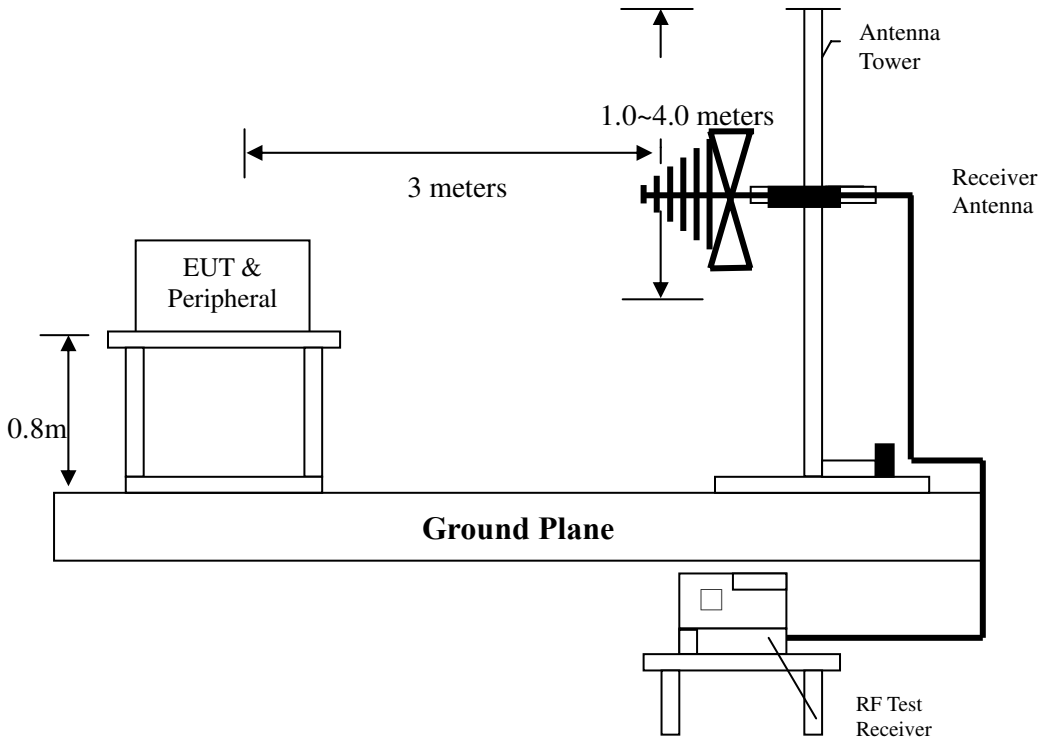
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
3. The height of the receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of the both horizontal and vertical polarization
4. If find the frequencies above the limit or below within 3dB, the antenna tower was scan (from 1m to 4m) and then the turntable was rotated to find the maximum reading.
5. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak and average reading Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
7. If the emissions level of the EUT in peak mode was 3dB lower than the average limit specified then testing will be stopped and peak values of the EUT will be reported. Otherwise, the emissions which do not have 3dB margin will be measured using the quasi-peak method for below 1GHz.
8. For testing above 1GHz, The emissions level of the EUT in peak mode was lower than average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.
9. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be quasi-peak measured by receiver.

7.5 Test configuration

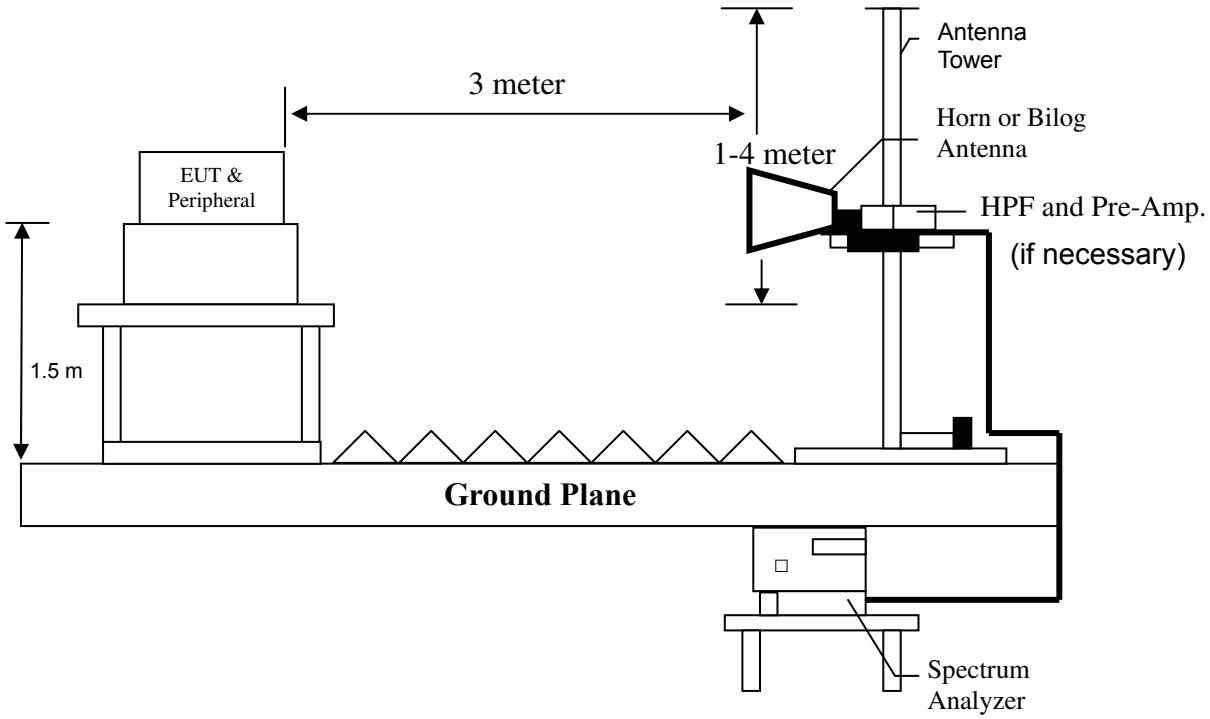
7.5.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:



7.5.2 Radiated emission below 1GHz using Bilog Antenna



7.5.3 Radiated emission above 1GHz using Horn Antenna



7.6 Test result

7.6.1 Measurement results: frequencies 9kHz to 30MHz

The test was performed on EUT under 802.11b/g/n continuously transmitting mode. The worst case occurred at 802.11b ch 11 .

EUT : SGW1
Worst Case : 802.11b ch 11

Polarity (circle)	Frequency (MHz)	Detection value	Factor (dB/m)	Reading (dBμV)	Value (dBμV/m)	Limit @ 3m (dBμV/m)	Tolerance (dB)
Plane	0.02	QP	20.92	55.42	76.33	121.58	-45.25
Plane	0.03	QP	20.86	50.28	71.14	118.06	-46.92
Plane	0.04	QP	20.85	46.30	67.14	115.56	-48.42
Plane	0.05	QP	20.83	45.30	66.13	113.62	-47.49
Plane	0.15	QP	20.77	30.66	51.43	104.08	-52.65
Plane	0.99	QP	21.30	20.53	41.83	67.69	-25.86
Plane	1.94	QP	21.38	14.64	36.02	69.54	-33.52
Plane	2.90	QP	21.44	11.29	32.73	69.54	-36.81

Remark: Corr. Factor = Antenna Factor + Cable Loss - PreAmplifier Gain

7.6.2 Measurement results: frequencies below 1 GHz

The test was performed on EUT under 802.11b/g/n continuously transmitting mode. The worst case occurred at 802.11b ch 11 .

EUT : SGW1
Worst Case : 802.11b ch 11

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBµV)	Corrected Level (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
Vertical	239.52	QP	19.85	18.28	38.13	46.00	-7.87
Vertical	292.87	QP	22.62	15.39	38.01	46.00	-7.99
Vertical	452.92	QP	26.07	14.16	40.23	46.00	-5.77
Vertical	507.24	QP	27.03	14.04	41.08	46.00	-4.92
Vertical	533.38	QP	27.48	14.21	41.69	46.00	-4.31
Vertical	560.00	QP	27.81	16.39	44.20	46.00	-1.80
Vertical	667.29	QP	30.05	10.55	40.60	46.00	-5.40
Horizontal	185.20	QP	17.58	16.95	34.53	43.50	-8.97
Horizontal	240.00	QP	19.85	23.30	43.15	46.00	-2.85
Horizontal	265.71	QP	21.61	14.69	36.31	46.00	-9.69
Horizontal	292.87	QP	22.62	17.23	39.84	46.00	-6.16
Horizontal	347.19	QP	24.02	18.54	42.56	46.00	-3.44
Horizontal	452.92	QP	26.07	14.51	40.58	46.00	-5.42

Remark: Corr. Factor = Antenna Factor + Cable Loss

7.6.3 Measurement results: frequency above 1GHz to 25GHz

EUT : SGW1
Test mode : TX Mode

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
802.11b Ch_1	4824	PK	V	40.10	-0.04	46.11	46.07	74.00	-27.93
	4980	PK	V	39.81	0.48	49.70	50.18	74.00	-23.82
	4824	PK	H	40.10	-0.04	46.97	46.93	74.00	-27.07
802.11b Ch_6	4874	PK	V	40.00	0.13	48.31	48.44	74.00	-25.56
	4980	PK	V	39.81	0.48	49.90	50.38	74.00	-23.62
	4874	PK	H	40.00	0.13	61.72	61.85	74.00	-12.15
	4874	AV	H	40.00	0.13	51.81	51.94	54.00	-2.06
802.11b Ch_11	4924	PK	V	39.91	0.30	50.00	50.30	74.00	-23.70
	4980	PK	V	39.81	0.48	49.26	49.74	74.00	-24.26
	4924	PK	H	39.91	0.30	56.99	57.29	74.00	-16.71
	4924	AV	H	39.91	0.30	53.19	53.49	54.00	-0.51
80211g Ch_1	4824	PK	V	40.10	-0.04	45.28	45.24	74.00	-28.76
	4980	PK	V	39.81	0.48	50.14	50.62	74.00	-23.38
	4824	PK	H	40.10	-0.04	48.24	48.20	74.00	-25.80
	4980	PK	H	39.81	0.48	46.05	46.53	74.00	-27.47
802.11g Ch_6	4874	PK	V	40.00	0.13	48.34	48.47	74.00	-25.53
	4980	PK	V	39.81	0.48	49.35	49.83	74.00	-24.17
	4874	PK	H	40.00	0.13	50.58	50.71	74.00	-23.29
	4980	PK	H	39.81	0.48	46.12	46.60	74.00	-27.40
802.11g Ch_11	4924	PK	V	39.91	0.30	49.74	50.04	74.00	-23.96
	4980	PK	V	39.81	0.48	49.55	50.03	74.00	-23.97
	4924	PK	H	39.91	0.30	52.90	53.20	74.00	-20.80
802.11n HT20 Ch_1	4824	PK	V	40.10	-0.04	45.58	45.54	74.00	-28.46
	4980	PK	V	39.81	0.48	49.40	49.88	74.00	-24.12
	4824	PK	H	40.10	-0.04	47.27	47.23	74.00	-26.77
	4980	PK	H	39.81	0.48	45.84	46.32	74.00	-27.68

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

EUT : SGW1
Test mode : TX Mode

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
802.11n HT20 Ch_6	4874	PK	V	40.00	0.13	45.77	45.90	74.00	-28.10
	4980	PK	V	39.81	0.48	50.06	50.54	74.00	-23.46
	4874	PK	H	40.00	0.13	49.88	50.01	74.00	-23.99
	4980	PK	H	39.81	0.48	46.49	46.97	74.00	-27.03
802.11n HT20 Ch_11	4924	PK	V	39.91	0.30	49.92	50.22	74.00	-23.78
	4980	PK	V	39.81	0.48	49.63	50.11	74.00	-23.89
	4924	PK	H	39.91	0.30	53.12	53.42	74.00	-20.58
802.11n HT40 Ch_1	4844	PK	V	40.06	0.03	46.10	46.13	74.00	-27.87
	4844	PK	H	40.06	0.03	46.46	46.49	74.00	-27.51
802.11n HT40 Ch_6	4874	PK	V	40.00	0.13	45.56	45.69	74.00	-28.31
	4874	PK	H	40.00	0.13	48.46	48.59	74.00	-25.41
802.11n HT40 Ch_11	4904	PK	V	39.95	0.23	48.00	48.23	74.00	-25.77
	4904	PK	H	39.95	0.23	48.64	48.87	74.00	-25.13

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

8. Emission On Band Edge

8.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Requirement	15.247(d), 15.205,	

8.2 Measuring instrument setting

Spectrum analyzer settings	
Spectrum Analyzer function	**Setting**
Detector	Peak
RBW	1MHz
VBW	3MHz for Peak and Average
Sweep	Auto couple
Restrict bands	2310~2390MHz
	2483.5 ~2500MHz
Attenuation	Auto

8.3 Test procedure

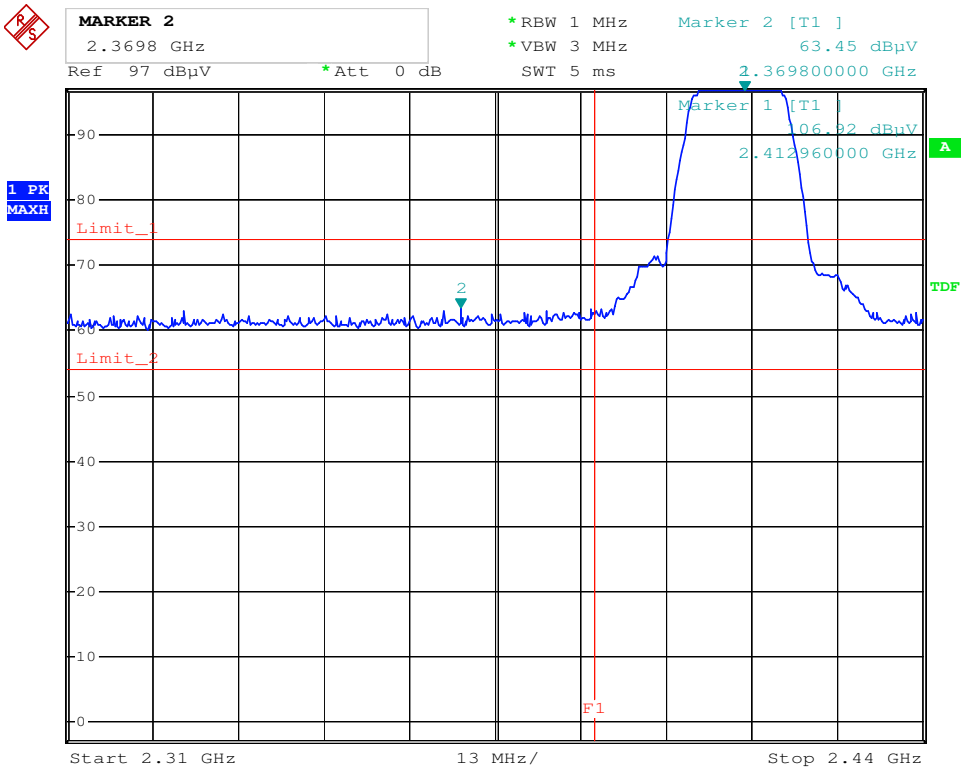
The test procedure is the same as clause 7.4

8.4 Test results

EUT : SGW1
Test mode : TX Mode

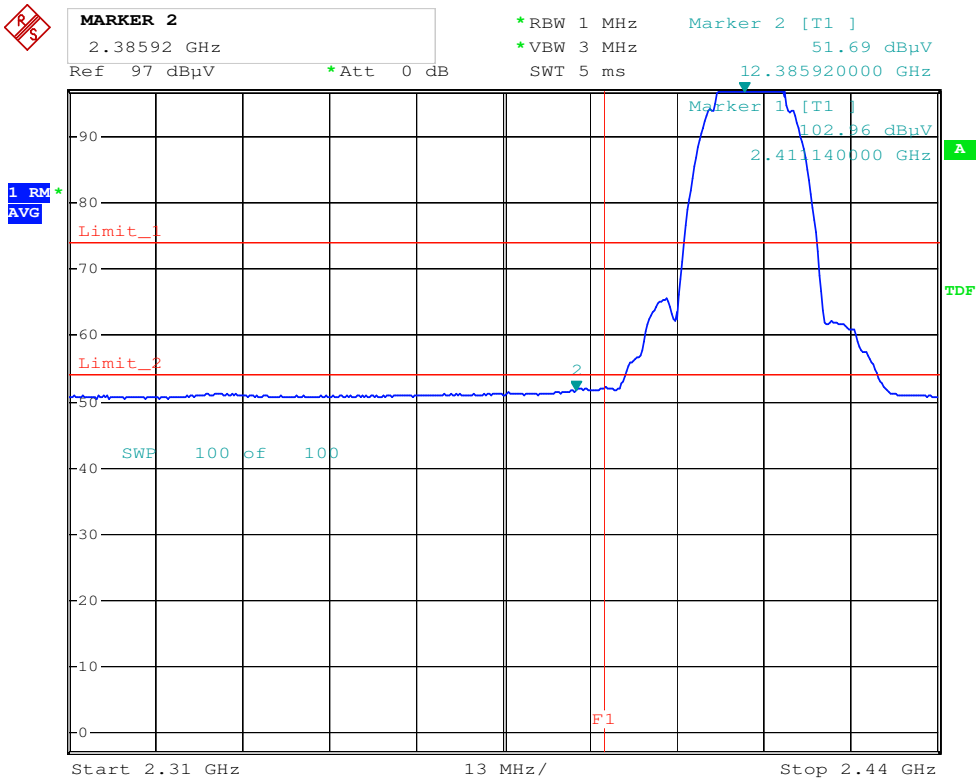
Mode	Freq. (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
802.11b Chain0	2369.80	PK	V	33.76	29.69	63.45	74	-10.55	2310~2390
	2385.92	AV	V	33.83	17.86	51.69	54	-2.31	
	2484.27	PK	V	34.30	31.77	66.07	74	-7.93	2483.5~2500
	2484.16	AV	V	34.30	16.39	50.69	54	-3.31	
802.11g Chain0	2387.36	PK	V	33.84	29.31	63.15	74	-10.85	2310~2390
	2389.28	AV	V	33.85	17.47	51.32	54	-2.68	
	2487.05	PK	V	34.32	32.13	66.45	74	-7.55	2483.5~2500
	2483.93	AV	V	34.30	17.11	51.41	54	-2.59	
802.11n (HT20)	2389.52	PK	V	33.85	28.50	62.35	74	-11.65	2310~2390
	2389.52	AV	V	33.85	17.63	51.48	54	-2.52	
	2484.04	PK	V	34.30	34.81	69.11	74	-4.89	2483.5~2500
	2484.04	AV	V	34.30	18.28	52.58	54	-1.42	
802.11n (HT40)	2388.84	PK	V	33.85	31.18	65.03	74	-8.97	2310~2390
	2389.40	AV	V	33.85	18.96	52.81	54	-1.19	
	2483.74	PK	V	34.30	28.78	63.08	74	-10.92	2483.5~2500
	2484.03	AV	V	34.30	17.69	51.99	54	-2.01	

Chain0 : Restricted-Band Band edge @ 802.11b mode Ch 1 Peak



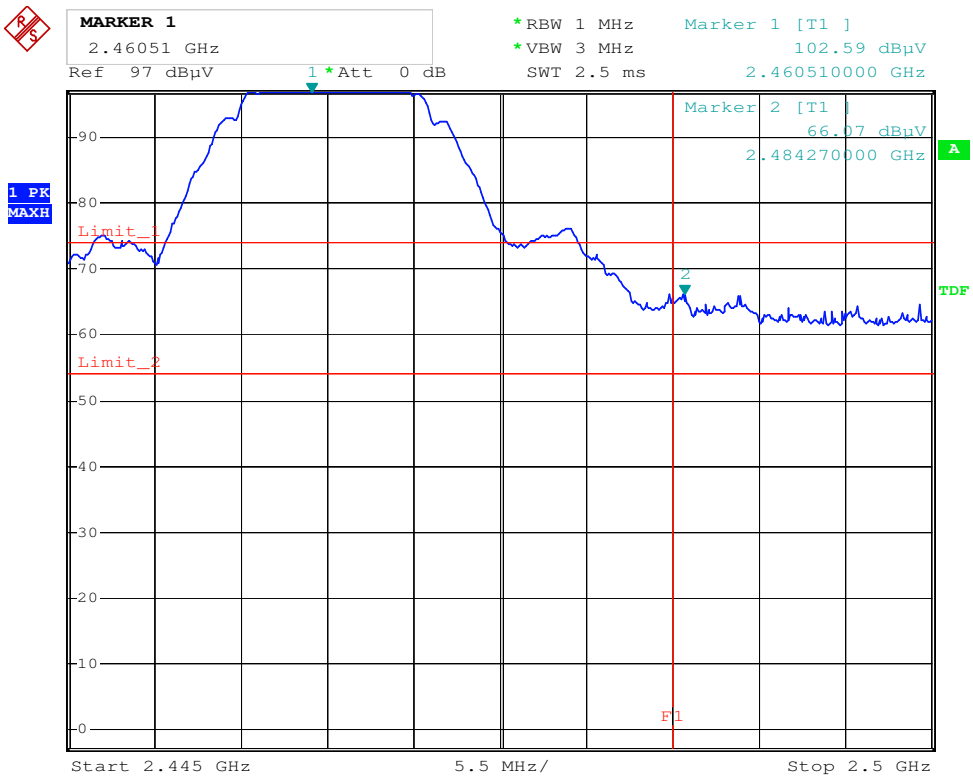
Date: 23.NOV.2016 16:05:08

Chain0 : Restricted-Band Band edge @ 802.11b mode Ch 1 Average



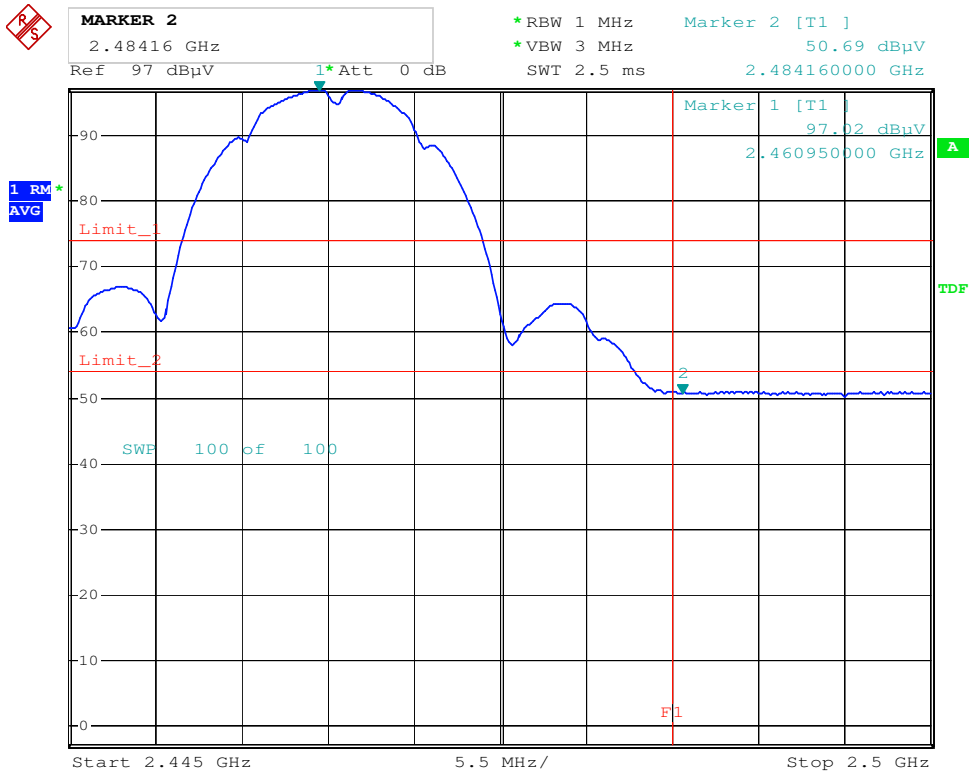
Date: 23.NOV.2016 16:06:11

Chain0 : Restricted-Band Band edge @ 802.11b mode ch11 Peak



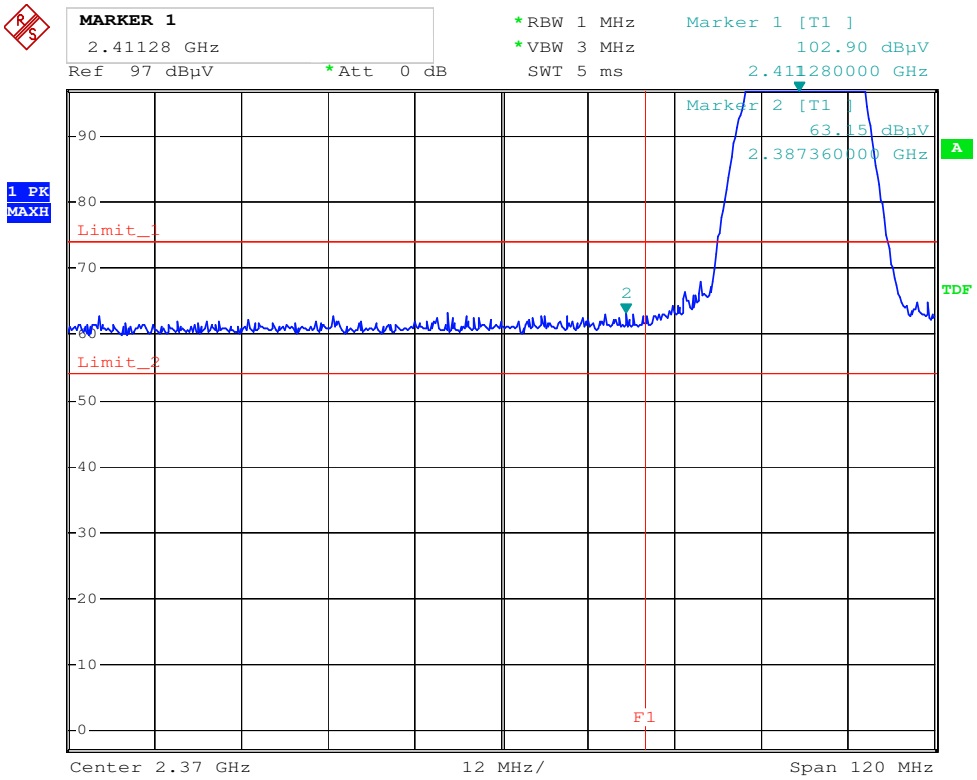
Date: 23.NOV.2016 16:12:06

Chain0 : Restricted-Band Band edge @ 802.11b mode ch11 Average



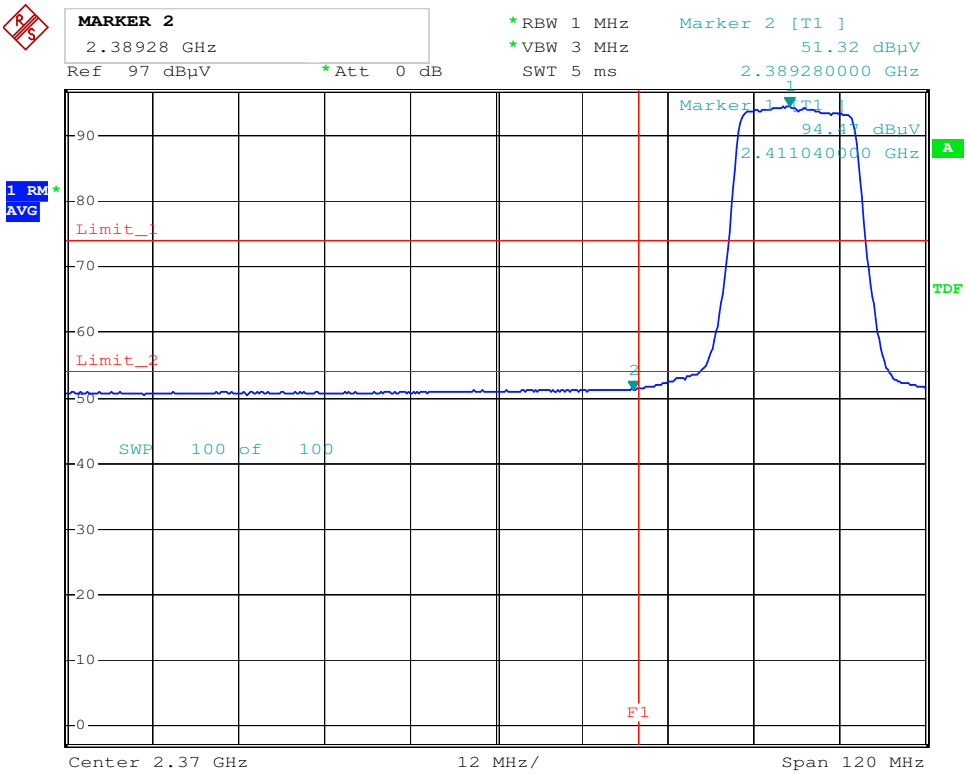
Date: 23.NOV.2016 16:27:47

Chain0 : Restricted-Band Band edge @ 802.11g mode ch1 Peak



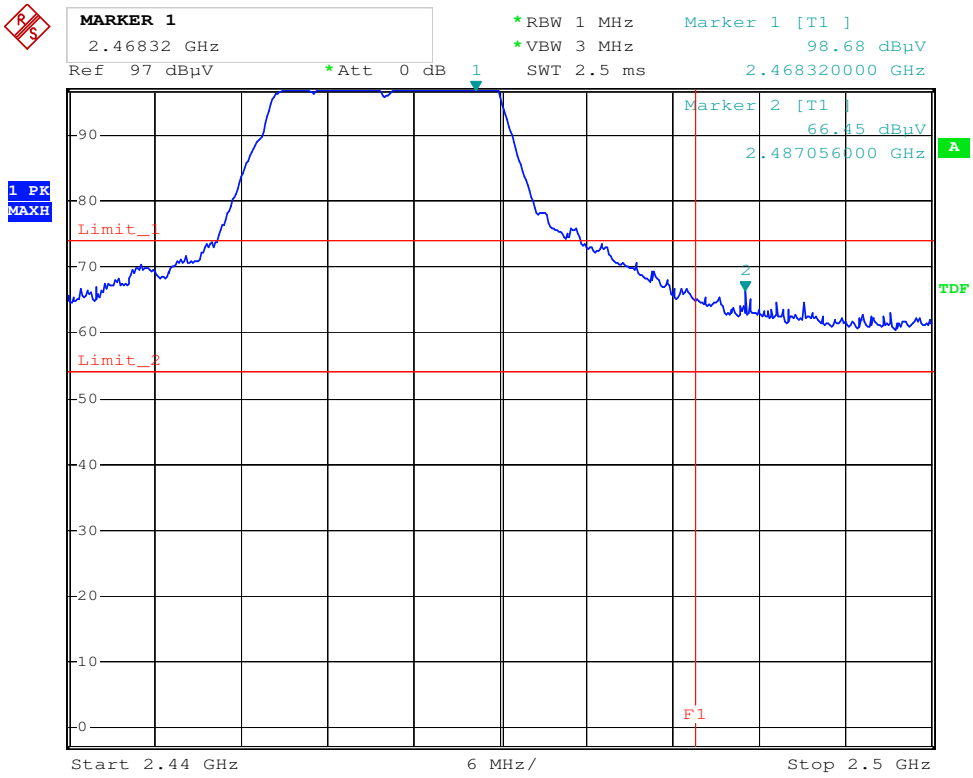
Date: 23.NOV.2016 17:33:41

Chain0 : Restricted-Band Band edge @ 802.11g mode ch1 Average



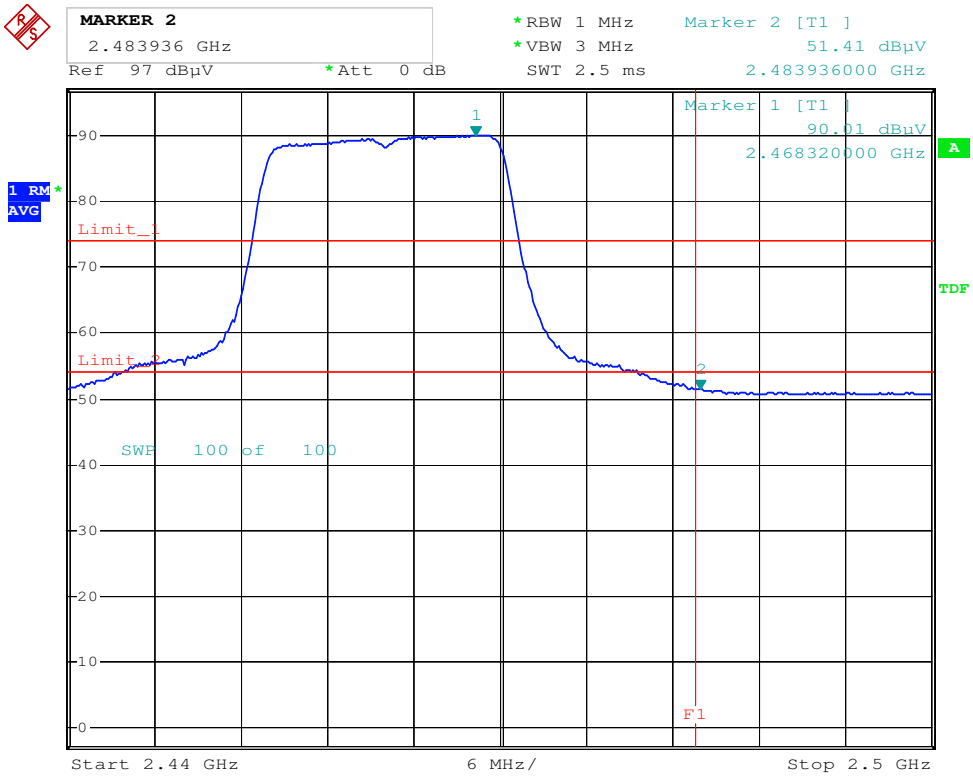
Date: 23.NOV.2016 17:35:06

Chain0 : Restricted-Band Band edge @ 802.11g mode ch11 Peak



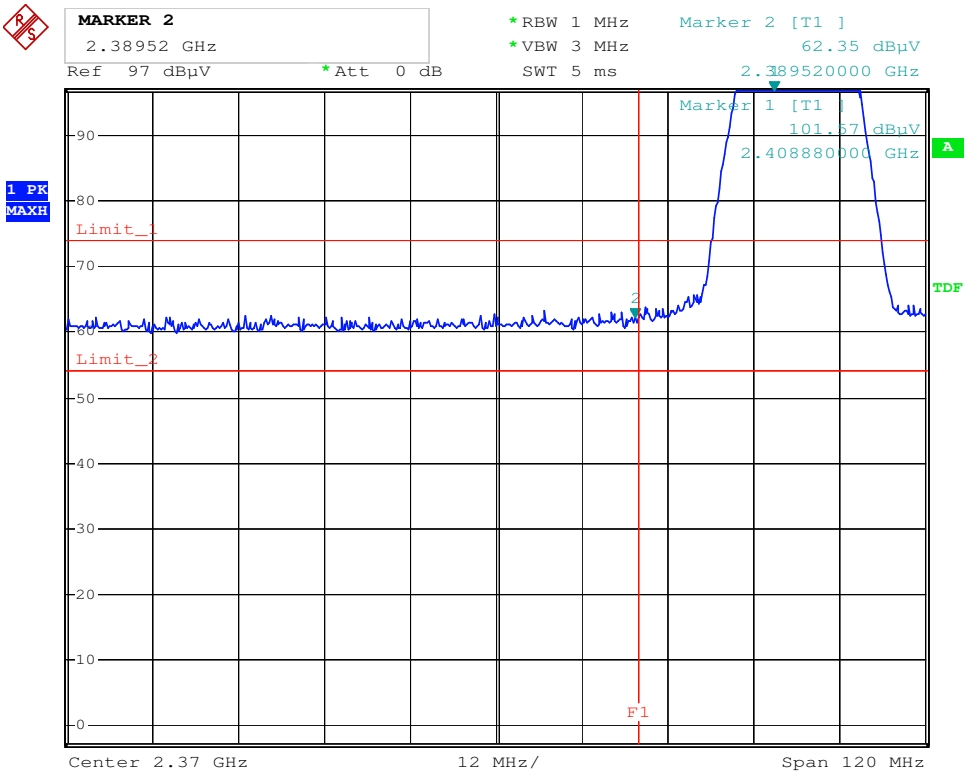
Date: 23.NOV.2016 18:10:58

Chain0 : Restricted-Band Band edge @ 802.11g mode ch11 Average



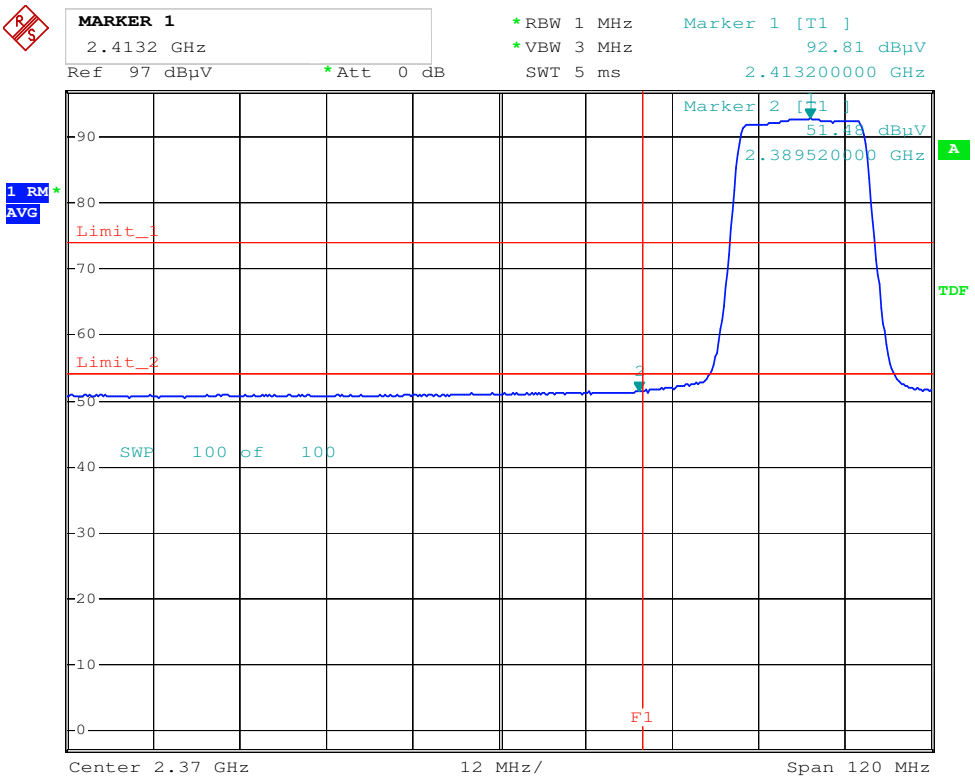
Date: 23.NOV.2016 18:12:16

Chain0 : Restricted-Band Band edge @ 802.11n(HT20) mode ch1 Peak



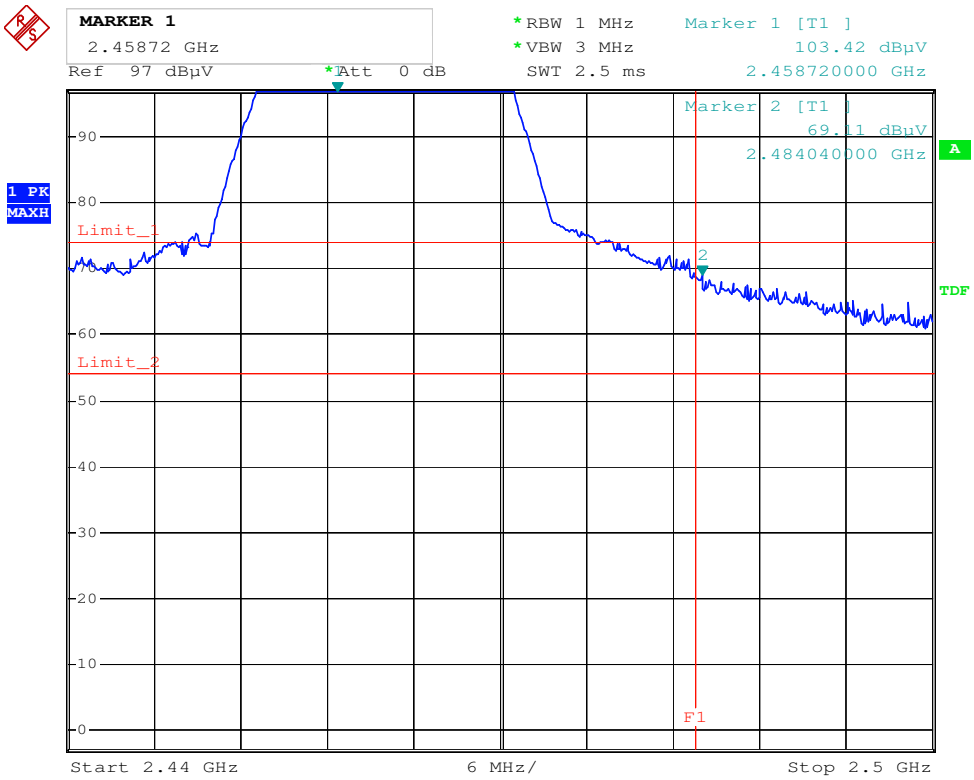
Date: 23.NOV.2016 17:22:26

Chain0 : Restricted-Band Band edge @ 802.11n(HT20) mode ch1 Average



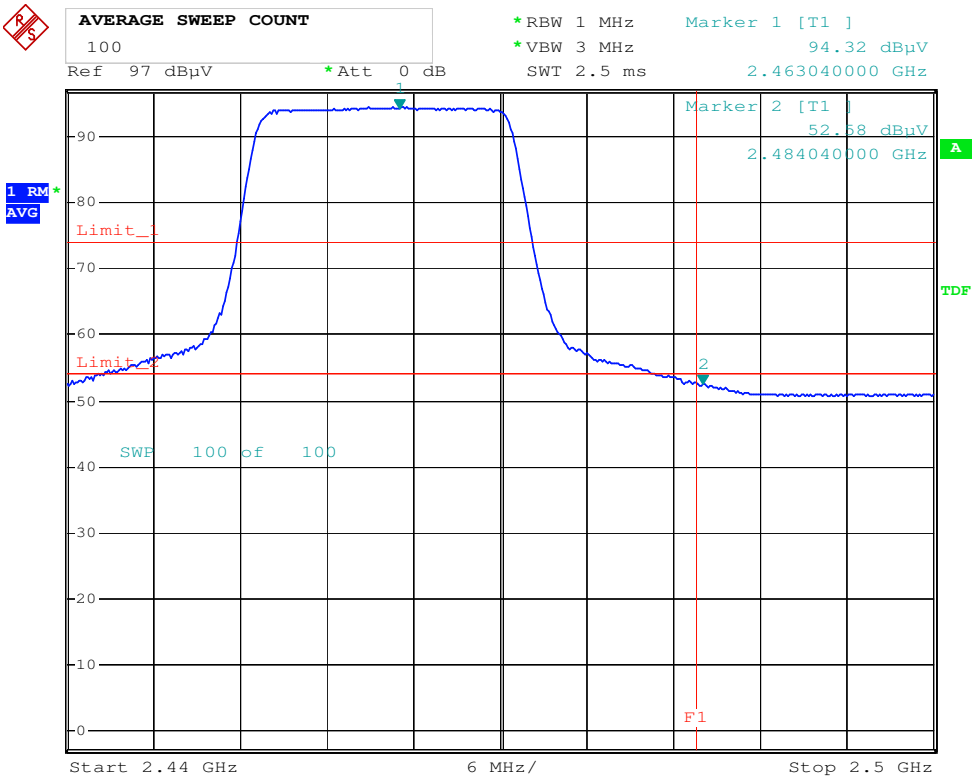
Date: 23.NOV.2016 17:22:58

Chain0 : Restricted-Band Band edge @ 802.11n(HT20) mode ch11 Peak



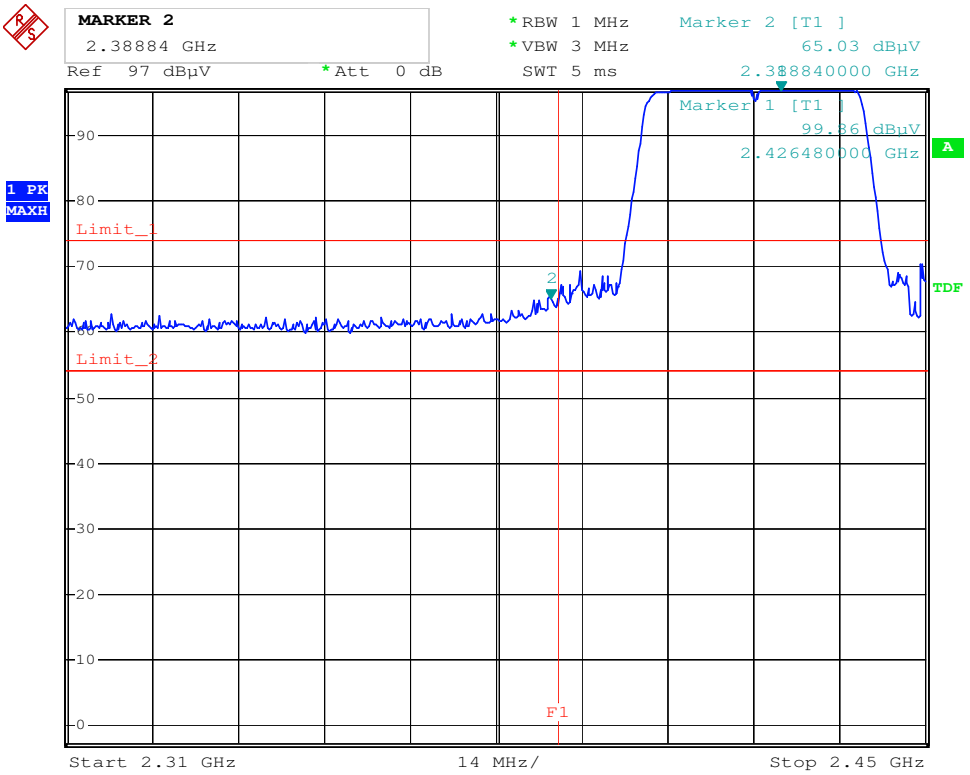
Date: 23.NOV.2016 17:16:57

Chain0 : Restricted-Band Band edge @ 802.11n(HT20) mode ch11 Average



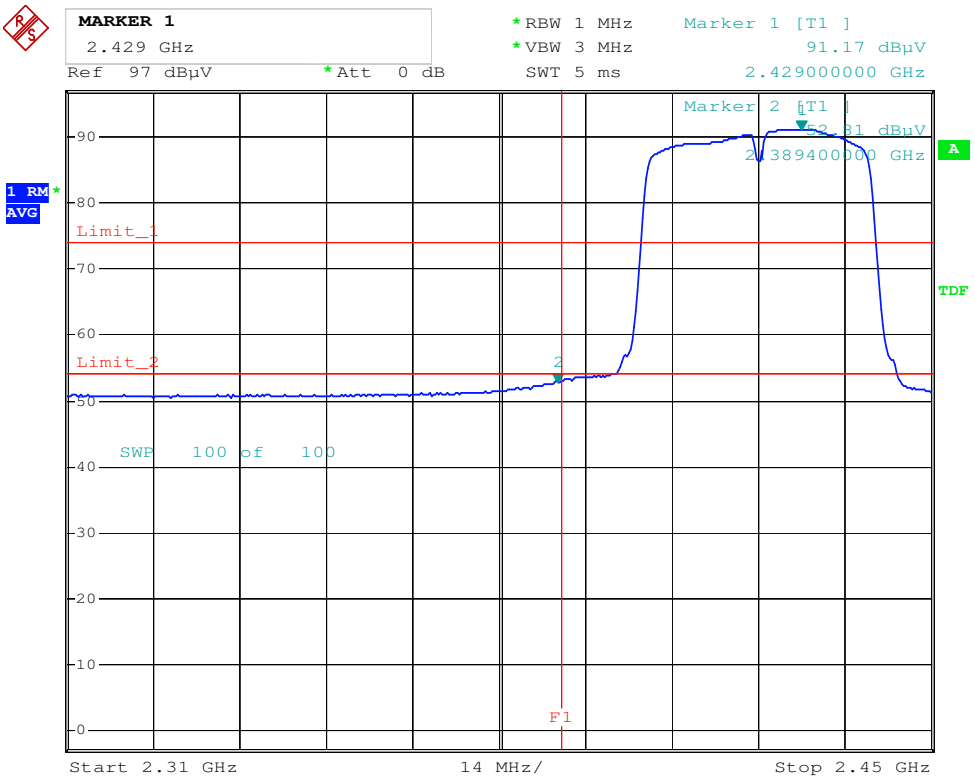
Date: 23.NOV.2016 17:18:19

Chain0 : Restricted-Band Band edge @ 802.11n(HT40) mode ch1 Peak



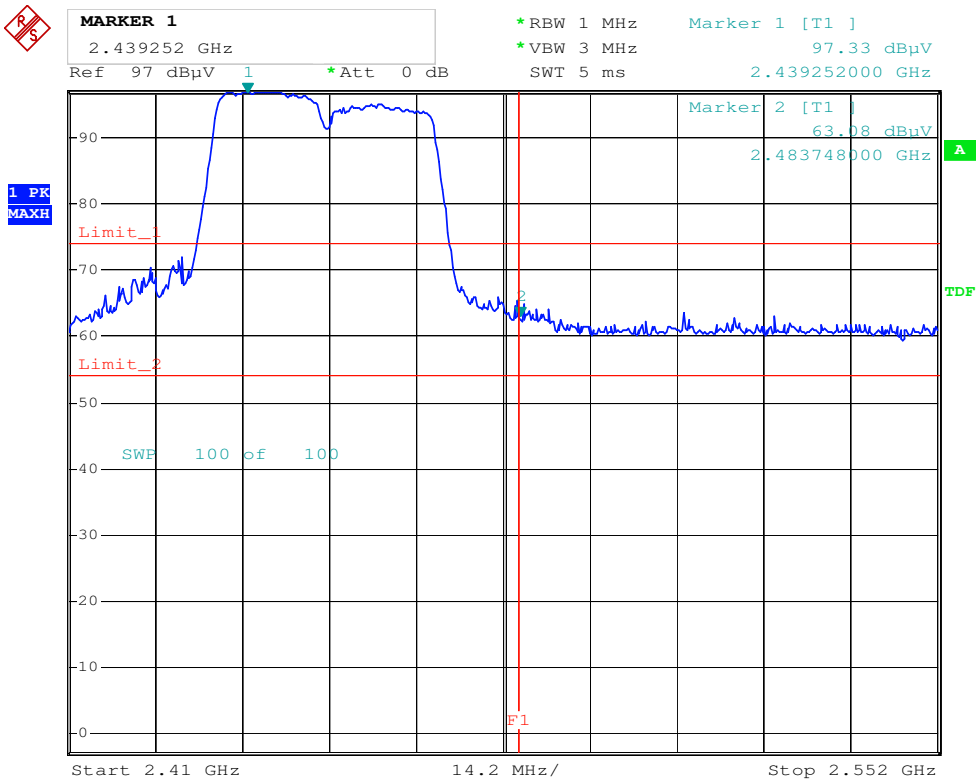
Date: 23.NOV.2016 17:55:05

Chain0 : Restricted-Band Band edge @ 802.11n(HT40) mode ch1 Average



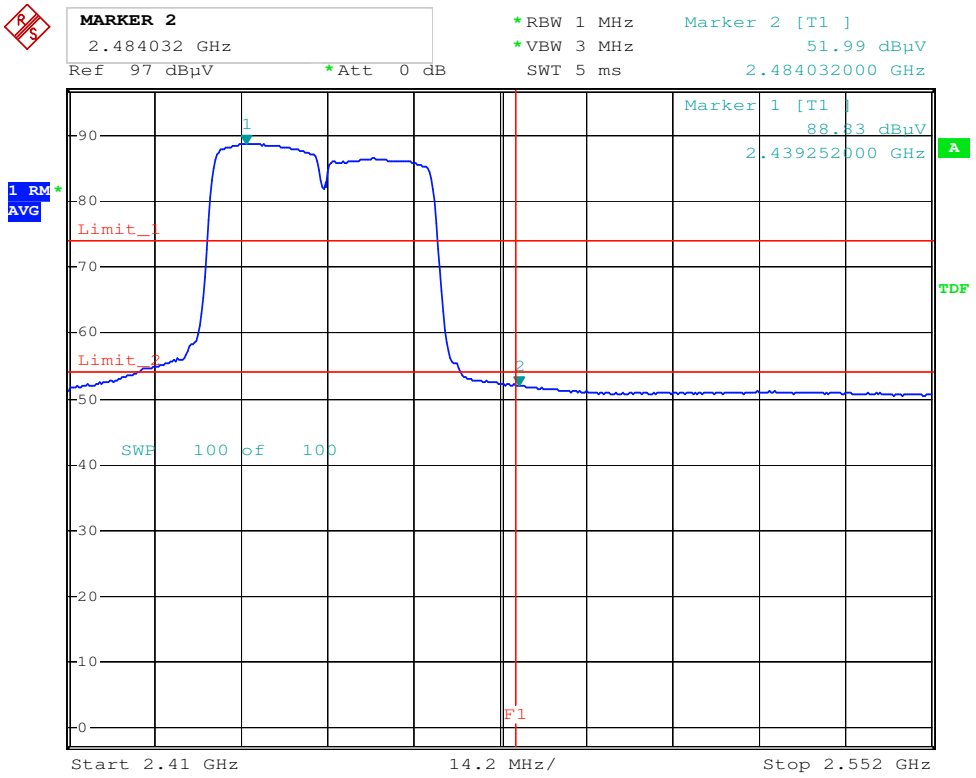
Date: 23.NOV.2016 17:56:11

Chain0 : Restricted-Band Band edge @ 802.11n(HT40) mode ch11 Peak



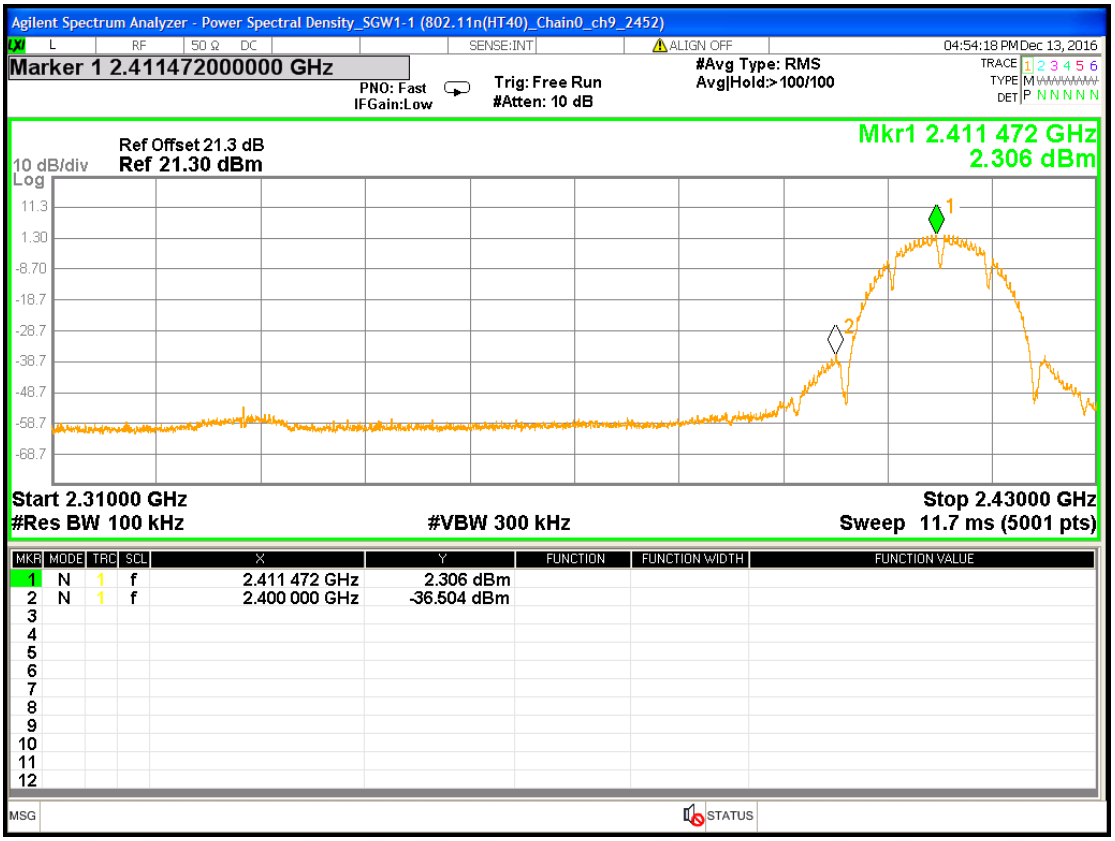
Date: 23.NOV.2016 18:04:52

Chain0 : Restricted-Band Band edge @ 802.11n(HT40) mode ch11 Average

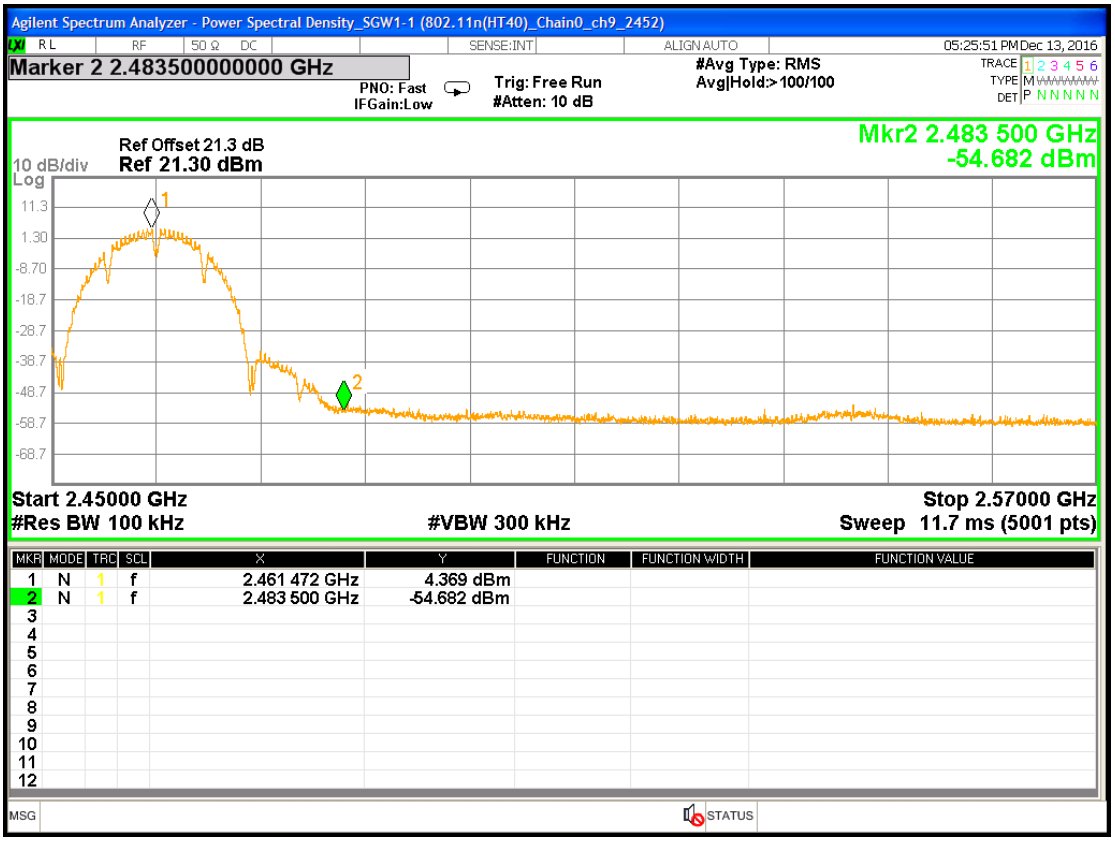


Date: 23.NOV.2016 18:05:31

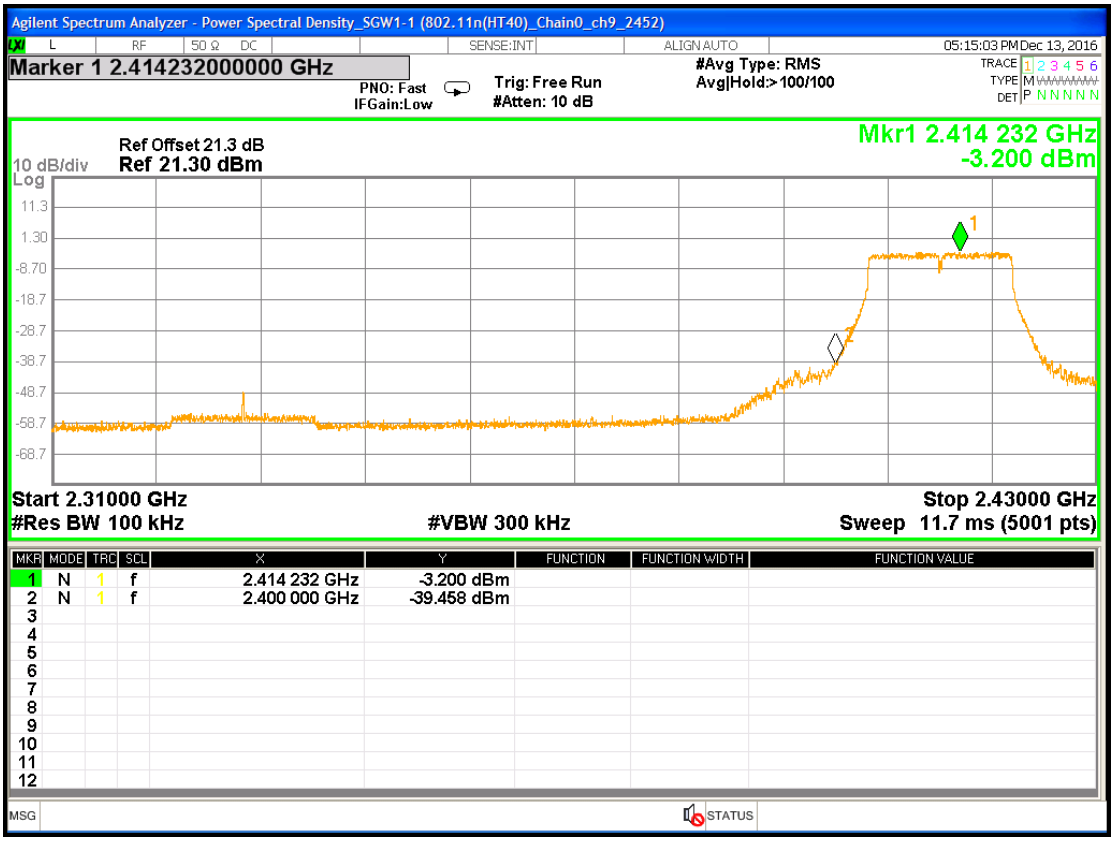
Chain0 : Authorized-Band Band edge @ 802.11b mode Ch 1



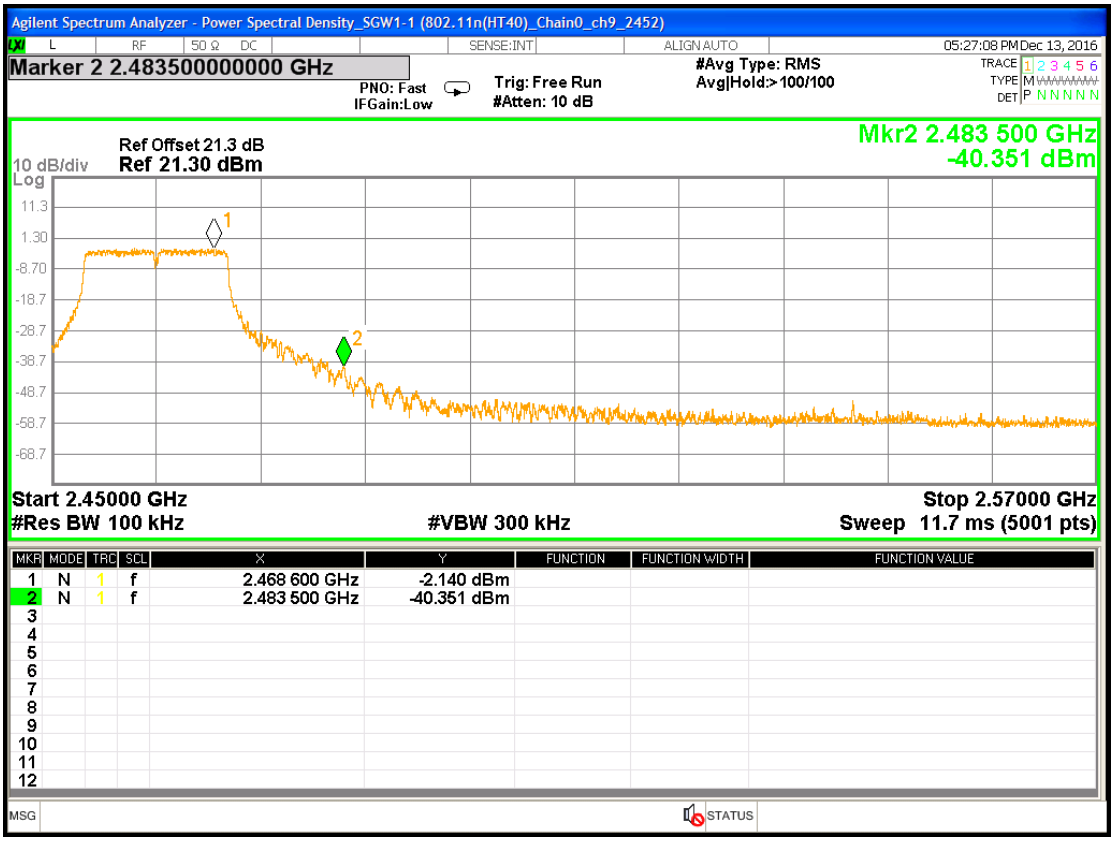
Chain0 : Authorized-Band Band edge @ 802.11b mode ch11



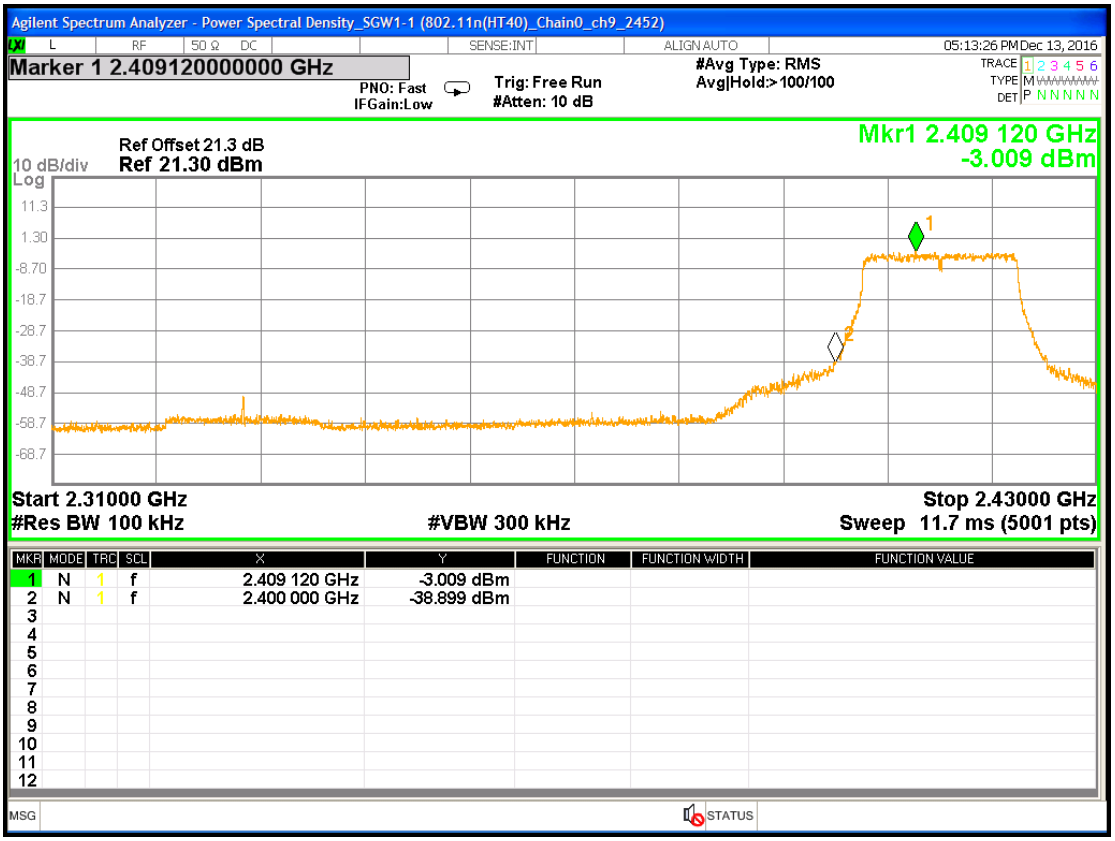
Chain0 : Authorized-Band Band edge @ 802.11g mode ch1



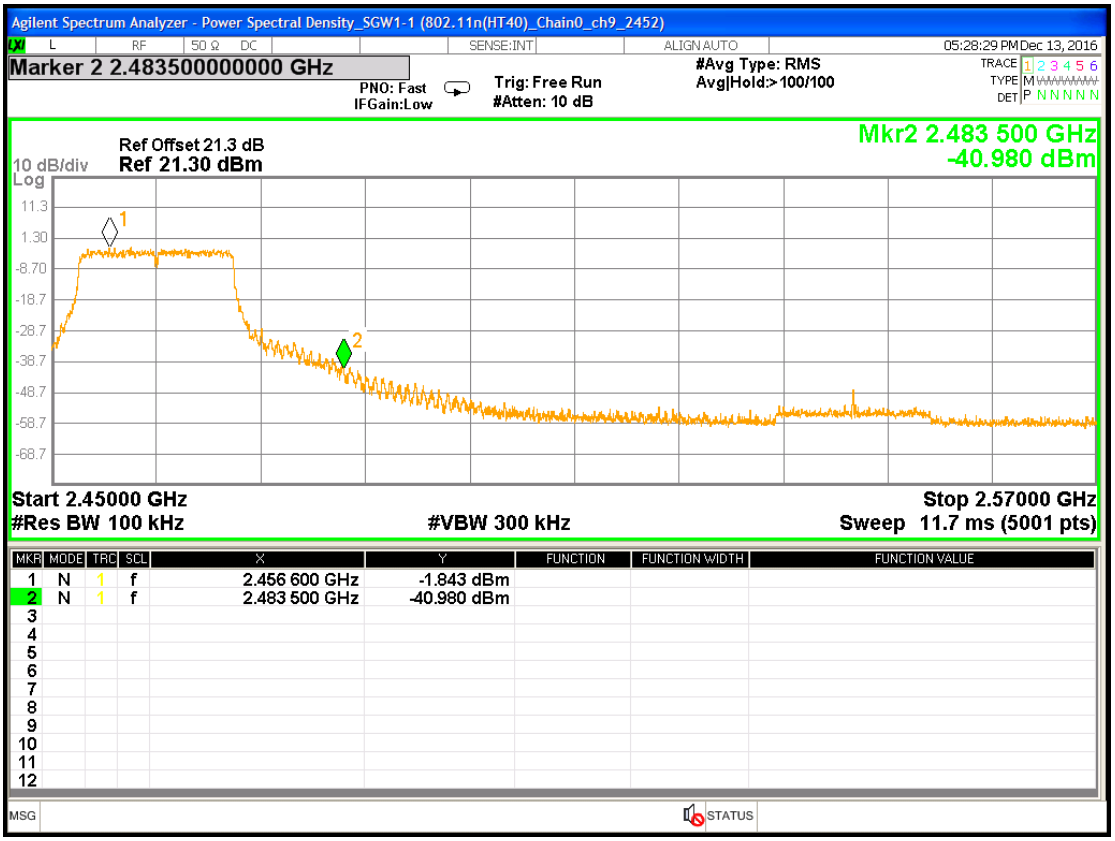
Chain0 : Authorized-Band Band edge @ 802.11g mode ch11



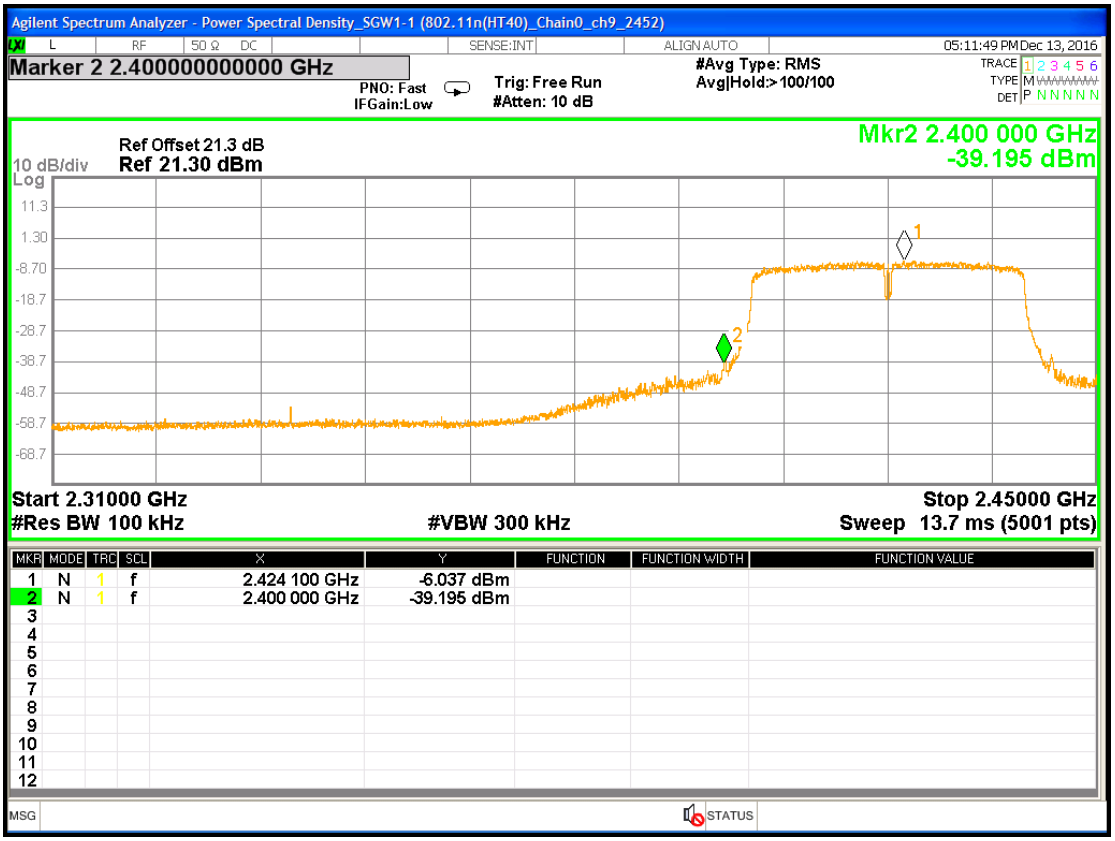
Chain0 : Authorized-Band Band edge @ 802.11n(HT20) mode ch1



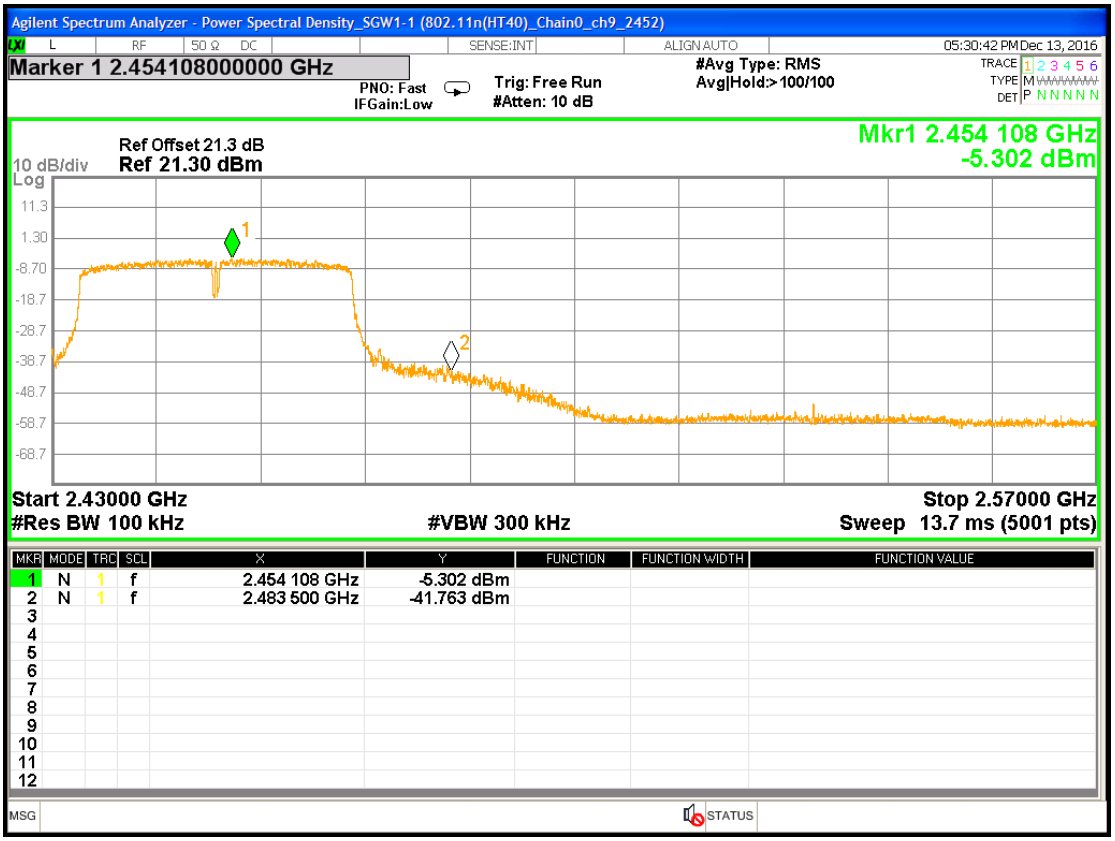
Chain0 : Authorized-Band Band edge @ 802.11n(HT20) mode ch11



Chain0 : Authorized-Band Band edge @ 802.11n(HT40) mode ch3



Chain0 : Authorized-Band Band edge @ 802.11n(HT40) mode ch9



9. AC Power Line Conducted Emission

9.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1008	hPa
Test Voltage	120V, 60Hz	
Requirement	15.207	
Date of test	Mar. 07, 2016	

9.2 Limit for AC power line conducted emission

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

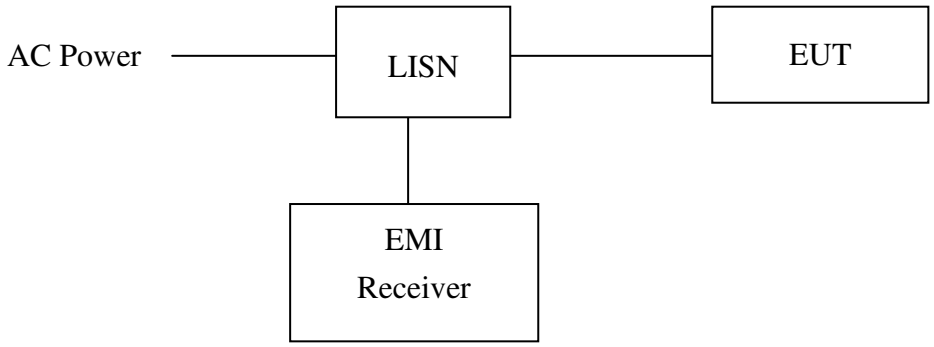
9.3 Measuring instrument setting

Receiver settings	
Receiver function	**Setting**
Detector	QP
Start frequency	0.15MHz
Stop frequency	30MHz
IF bandwidth	9 kHz
Attenuation	10dB

9.4 Test procedure

1. Configure the EUT according to ANSI C63.10. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
3. All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30MHz was searched
5. Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
6. The measurement has to be done between each power line and ground at the power terminal.

9.5 Test diagram



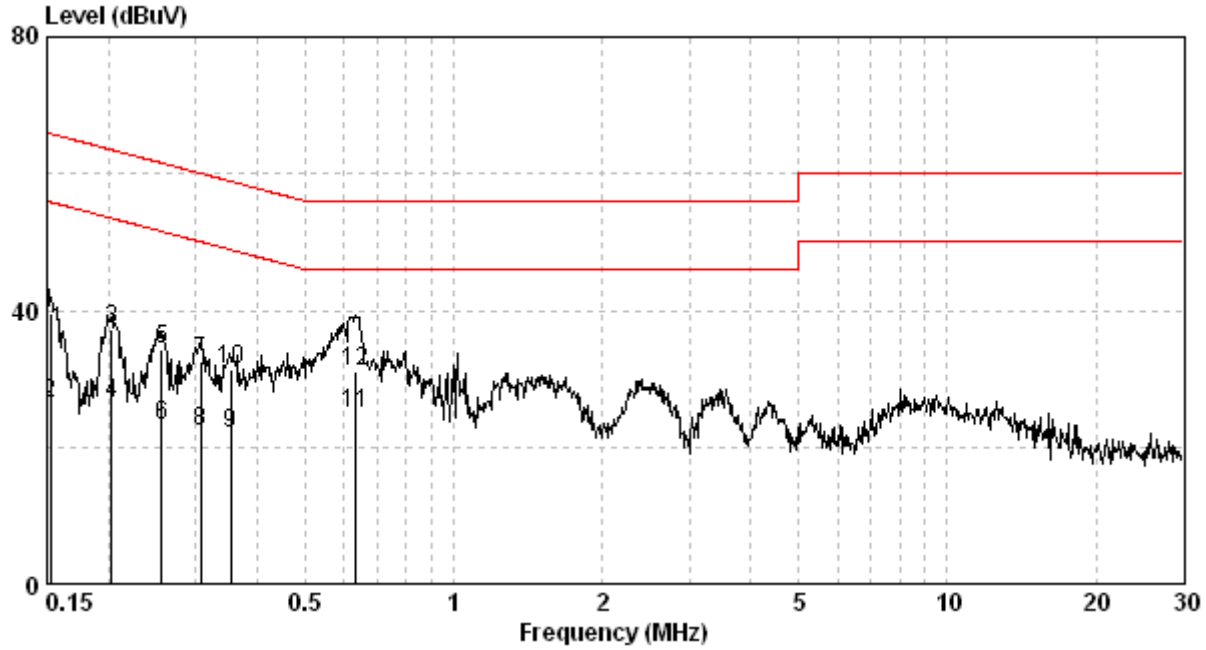
Note: The EUT was tested while in normal communication mode.

9.6 Test results

Phase: Live Line
Model No.: SGW1
Test Condition: Normal communication

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.152	9.74	39.63	65.87	26.30	55.87	-26.24	-29.57
0.203	9.74	37.31	63.49	26.44	53.49	-26.18	-27.05
0.256	9.75	34.18	61.56	23.18	51.56	-27.38	-28.38
0.307	9.76	32.49	60.06	22.24	50.06	-27.57	-27.82
0.354	9.76	31.44	58.87	22.03	48.87	-27.43	-26.84
0.634	9.79	31.19	56.00	24.85	46.00	-24.81	-21.15

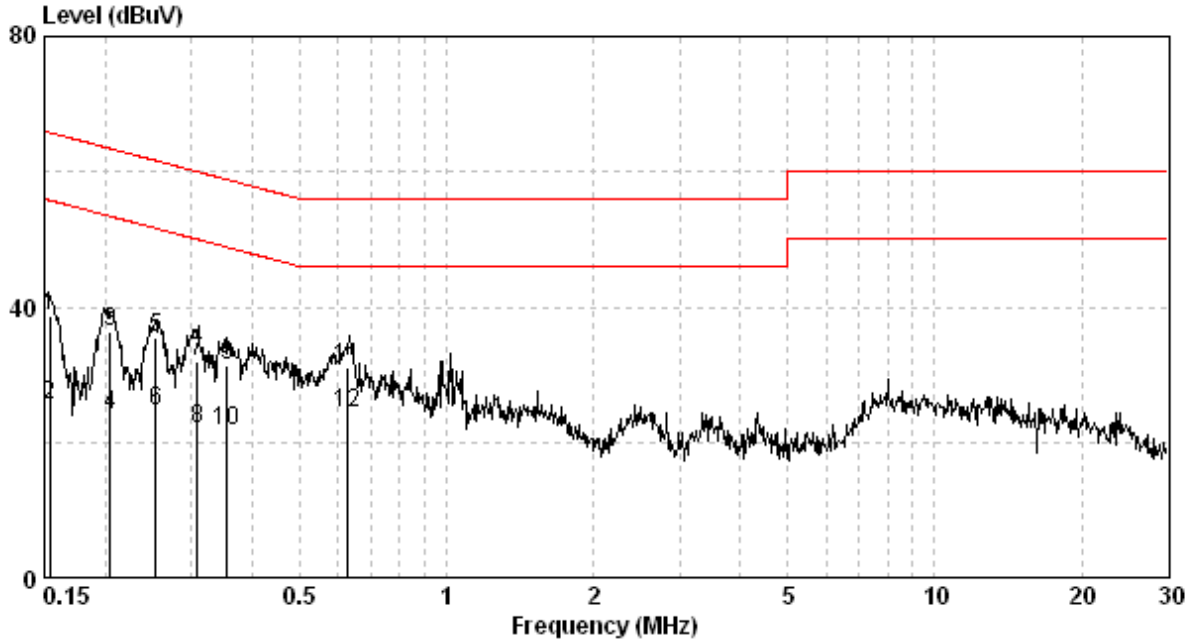
Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral Line
Model No.: SGW1
Test Condition: Normal communication

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.154	9.74	38.66	65.78	25.52	55.78	-27.12	-30.26
0.205	9.74	36.23	63.40	24.15	53.40	-27.17	-29.25
0.253	9.75	35.42	61.64	24.63	51.64	-26.22	-27.01
0.308	9.76	32.09	60.02	21.92	50.02	-27.93	-28.10
0.356	9.76	31.39	58.83	21.66	48.83	-27.43	-27.16
0.627	9.81	31.21	56.00	24.39	46.00	-24.79	-21.61

Remark:
1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Appendix A: Test equipment list

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
ESCI EMI Test Receiver	Rohde & Schwarz	ESCI	100018	2016/11/30	2017/11/29
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2016/08/16	2017/08/15
Horn Antenna (1-18G)	SHWARZBECK	BBHA 9120 D	9120D-456	2014/08/29	2017/08/27
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2014/09/16	2017/09/14
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2016/03/22	2017/03/21
Pre-Amplifier	EMC Co.	EMC12635SE	980205	2016/10/08	2017/10/07
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2016/09/12	2017/09/11
Power Meter	Anritsu	ML2495A	0844001	2016/11/09	2017/11/08
Power Sensor	Anritsu	MA2411B	0738452	2016/11/09	2017/11/08
Signal Analyzer	Agilent	N9030A	MY51380492	2016/09/13	2017/09/12
966-2(A) Cable 9kHz~26.5GHz	SUHNER	SMA / EX 100	N/A	2016/05/05	2017/05/04
966-2(B) Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 104P	CB0005	2016/05/04	2017/05/03
RF Cable 9kHz~26.5GHz	SUHNER	SUCOFLEX 102	CB0006	2016/05/05	2017/05/04
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2016/02/24	2017/02/22
High Pass Filter	Reactel	7HS-3G/18G-S11	N/A	2016/06/03	2017/06/02
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2016/03/03	2017/03/02
Attenuator	PASTERNACK	N/A	PA7001-20	2016/05/06	2017/05/05
Attenuator	EMCI	N/A	AT-N0619	2016/05/06	2017/05/05

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration
EMI Receiver	R&S	ESCI	100059	2016/11/21	2017/11/20
Two-Line V-Network	R&S	ENV216	101159	2016/06/02	2017/06/01
Artificial Mains Network (LISN)	SCHAFFNER	MN2050D	1586	2016/05/25	2017/05/24
CON-1 Shielded Room	N/A	N/A	N/A	NCR	NCR
CON-1 Cable	SUHNER	SUCOFLEX-104	26438414	2016/05/05	2017/05/04
Test software	Audix	e3	4.2004-1-12k	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of *k*=2.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.14 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.22 dB
Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	3.64 dB
Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.7 dB
Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m	2.7 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.53 dB
Emission on the Band Edge Test	3.64 dB
Minimum 6 dB Bandwidth	0.85 dB
Maximum Peak Conducted Output Power	0.42 dB
Power Spectral Density	0.85 dB
Emissions In Non-Restricted Frequency Bands	0.85 dB
AC Power Line Conducted Emission	2.47 dB