

Produkte
Products

Prüfbericht - Nr.: 19660260 001		Seite 1 von 77	
<i>Test Report No.:</i>		<i>Page 1 of 77</i>	
Auftraggeber: <i>Client:</i>	Redpine Signals Inc. 2107 N. First Street, Suite 680, San Jose, CA 95131-2019 United States		
Gegenstand der Prüfung: <i>Test item:</i>	High Performance Module		
Bezeichnung: <i>Identification:</i>	RS9113DBH	Serien-Nr.: <i>Serial No.</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803166512	Eingangsdatum: <i>Date of receipt:</i>	19.09.2016
Prüfört: <i>Testing location:</i>	Refer Page 4 of 77 for test facilities		
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15: Subpart C 15.247 ANSI C63.10-2013		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test items passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (India) Pvt. Ltd. 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India FCC Registration No.: 176555		
geprüft / tested by:		kontrolliert / reviewed by:	
27.09.2016	Raghavendra Katti Engineer	29.09.2016	Vinay N Ast. Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>
	Unterschrift <i>Signature</i>		Unterschrift <i>Signature</i>
Sonstiges / Other Aspects: FCC ID: XF6-RS9113DBH			
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p> <p><i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

TÜV Rheinland India Pvt. Ltd. 82/A, 3rd Main, West Wing Electronic City Phase 1, Hosur Road, Bangalore-560100, India
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Test Result Summary

Clause	Test Item	Result
Section 15.247(b) (3)	Maximum Average Conducted Output Power	Pass
Section 15.247(e)	Maximum Power Spectral Density	Pass
Section 15.247(a) (2)	6 dB Bandwidth	Pass
Section 15.247(d)	Emissions in non-restricted frequency bands	Pass
Section 15.209 / 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass
Section 15.207	Conducted Emission Test on A.C. Power Line	Pass

Note: Conducted measurements are done according to the procedure given in KDB No. **558074 D01 DTS Measurement Guidance v03r05**

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Maximum Average Conducted Output Power	Section 15.247(b) (3)
Maximum Power Spectral Density	Section 15.247(e).....
6 dB Bandwidth	Section 15.247(a) (2).....
Emissions in restricted frequency bands	Section 15.247(d).....
Spurious Radiated Emissions and	
Restricted Bands of Operation	Section 15.209 and 15.205
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List of Test and Measurement Instruments

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Periodicity	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	23.11.2016	Yearly	Spurious Radiated Emissions
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	10.06.2017	Yearly	
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	22.12.2016	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	14.03.2017	Yearly	
Emission Horn Antenna	ETS Lindgren	116706	00107323	02.11.2016	Yearly	
Anechoic Chamber	Frankonia	-	-	-	-	
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	23.04.2017	Yearly	Antenna - Port Conducted Tests
LISN	Rohde & Schwarz	ENV 4200	100163	07.09.2017	Yearly	AC Power line Measurement
EMI Test Receiver	Rohde & Schwarz	ESR7	101133	10.12.2017	Yearly	

Testing Facilities:

TUV Rheinland (India) Private Limited
 No. 108, West Wing
 Electronic city Phase I
 Bangalore – 560100

General Product Information

Product Function and Intended Use

The RS9113DBH module family is based on Redpine Signals' RS9113 ultra-low-power, single spatial stream, dual-band 802.11abgn. The modules are high performance single band and 2.4GHz/5GHz dual band devices IEEE 802.11abgn WLAN standards. The modules integrate a multi-threaded MAC processor with integrated analog peripherals and support for digital peripherals, baseband digital signal processor, analog front-end, crystal oscillator, calibration OTP memory, dual-band RF transceiver, dual-band high-power amplifiers, baluns, diplexers, diversity switch and Quad-SPI flash. They support host-based software architectures as well as fully embedded architectures. The interface to the host processor is available over SDIO, USB, SPI and UART interfaces. These modules are shielded. . We are using two RF ports RFOUT1 and RFOUT2, in which RFOUT2 was used for testing. The firmware in this module will allow transmitting or receiving in only one path that is RFOUT2.

Ratings and System Details

Operating Frequency Range	2400MHz – 2483.50MHz	
No. of channel	11	
Channel Spacing	5 MHz	
Transmitted Power	802.11b	24.97dBm
	802.11g	23.75dBm
	802.11n	24.47dBm
Data Rate	802.11b: 1,2, 5.5,11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: 6.5, 14.4, 21.7, 28.9, 39, 57.8, 65Mbps	
Antenna Type	External	
Number of antenna	One	
Antenna Gain	2dBi	
Supply Voltage to module	3.1V – 3.6V DC from Host device	
Environmental	-40°C to +85°C	

Test Conditions:

Supply Voltage: 5V DC from Adapter

Environmental conditions:

Temperature: +24 °C RH: 62%

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Table of frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz_20MHz BW Channel	1	2412
	2	2417
	3	2422
	4	2427
	5	2432
	6	2437
	7	2442
	8	2447
	9	2452
	10	2457
	11	2462

Channel Indication

Low : 2412 MHz

Mid : 2442 MHz

High : 2462 MHz

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Test Set-up and Operation Mode

Principle of Configuration Selection

Transmission was enabled with 100% duty cycle on low, mid and high channel.

Test Operation and Test Software

Test software was used to enable the transmission with 100% duty cycle, changing channels (low/mid/high) and data rates on the EUT for the tests in this report.

Note: The firmware in this module will allow transmitting or receiving in only one path that is RFOUT2.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- None

Test Modes – Data Rates and Modulations

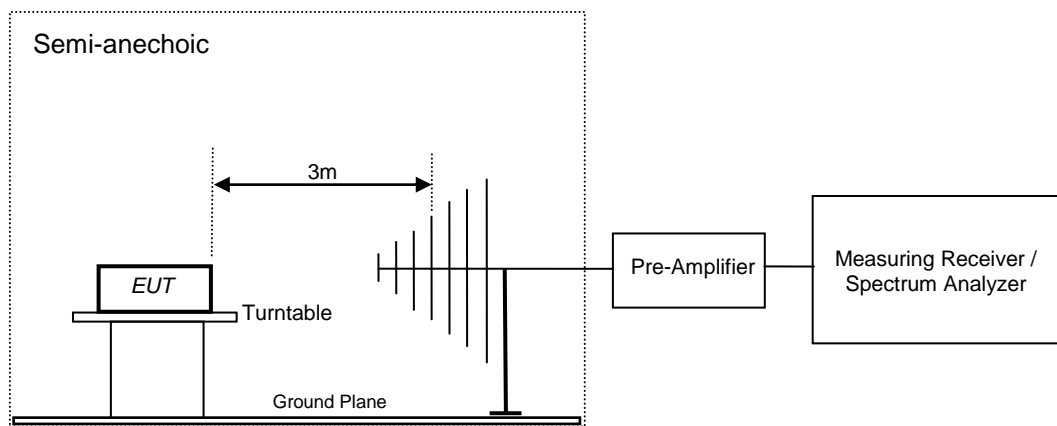
For Radiated spurious emissions, the tests were performed for all data rates and only worst case results are reported in this report.

Test Methodology

Radiated Emission Test

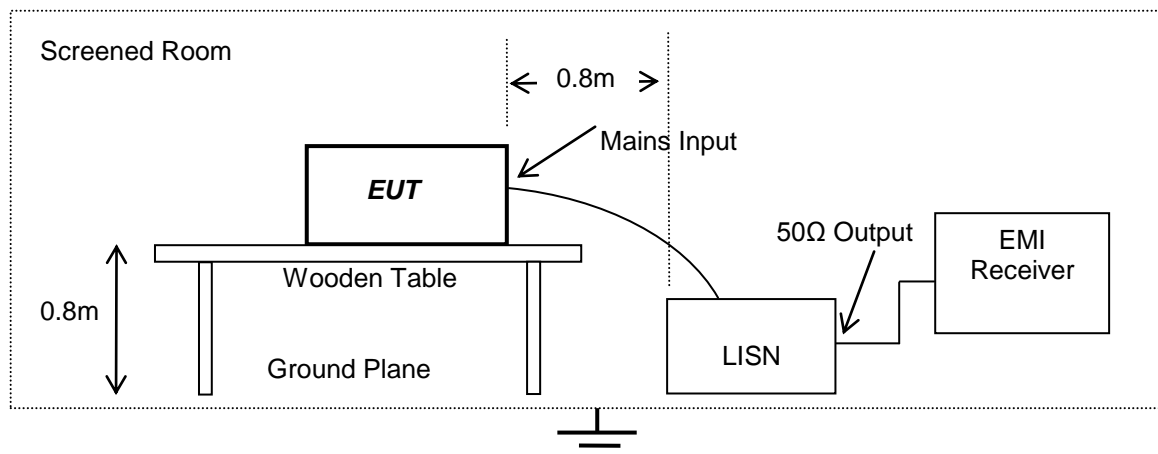
The radiated emission measurement was performed according to the procedures in ANSI C63.10 - 2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable for below 1GHz and 1.5m high turntable for above 1GHz, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna.

The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



Conducted Emission Test on A.C. mains line

The equipment under test (EUT) was placed on a wooden table 80cm above the ground plane, the LISN was placed 80cm away from the EUT. The test was performed in accordance with ANSI C63.10 - 2013, with the following: an initial measurement was performed in peak and average detection mode on the live and neutral lines. The pre-scan was performed by peak detection on both live and neutral conductors. Any emissions recorded within 20dB of the relevant limit line were re-measured using quasi-peak and average detections, the 6 worst cases were recorded in the table of results.



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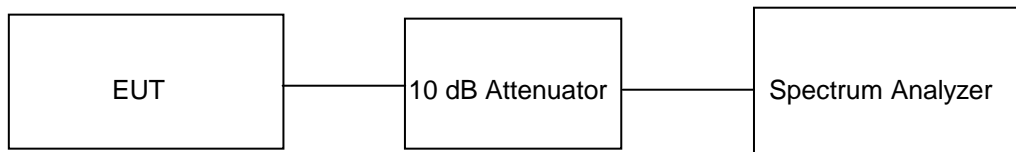
Test Results

Maximum Average Conducted Output Power Result

Section 15.247(b) (3)
Pass

Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	300 kHz
Requirement	<1 watt (30dBm).

Test Method:

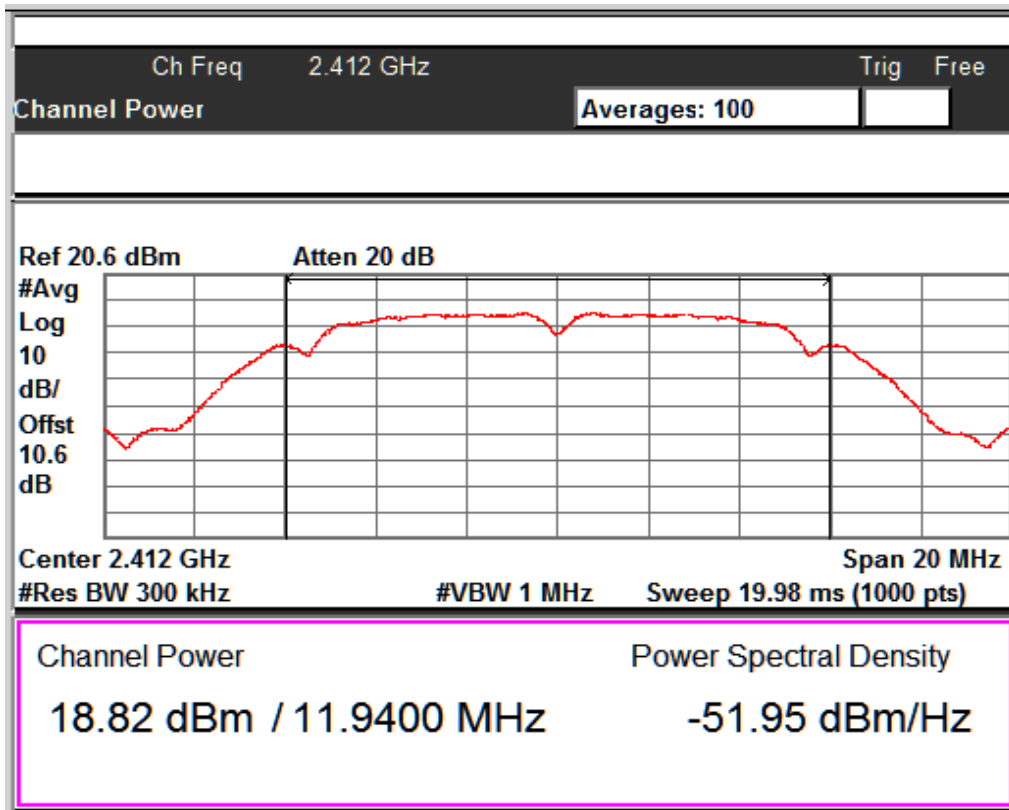


Note: For measurement of Maximum Average conducted output power method AVGSA-1 was used

Cable Loss (0.6dB) + Attenuator (10dB): 10.6 dB (Included in the test results)

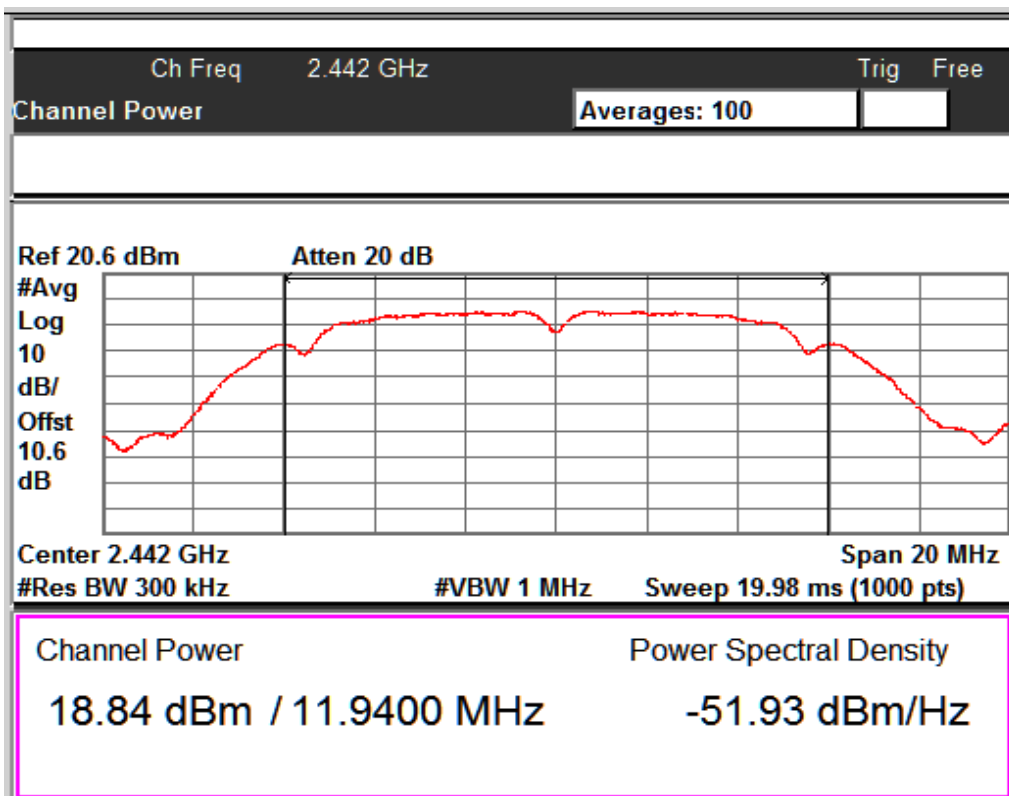
802.11 Protocol	Data Rate (Mbps)	Channel	Total Power (dBm)	Limit (dBm)	Margin (dB)
b Mode	1 Mbps	Low	18.82	30	-11.18
		Mid	18.84	30	-11.16
		High	19.31	30	-10.69
	11 Mbps	Low	23.16	30	-6.84
		Mid	24.97	30	-5.03
		High	22.16	30	-7.84

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Data Rate: 1 Mbps

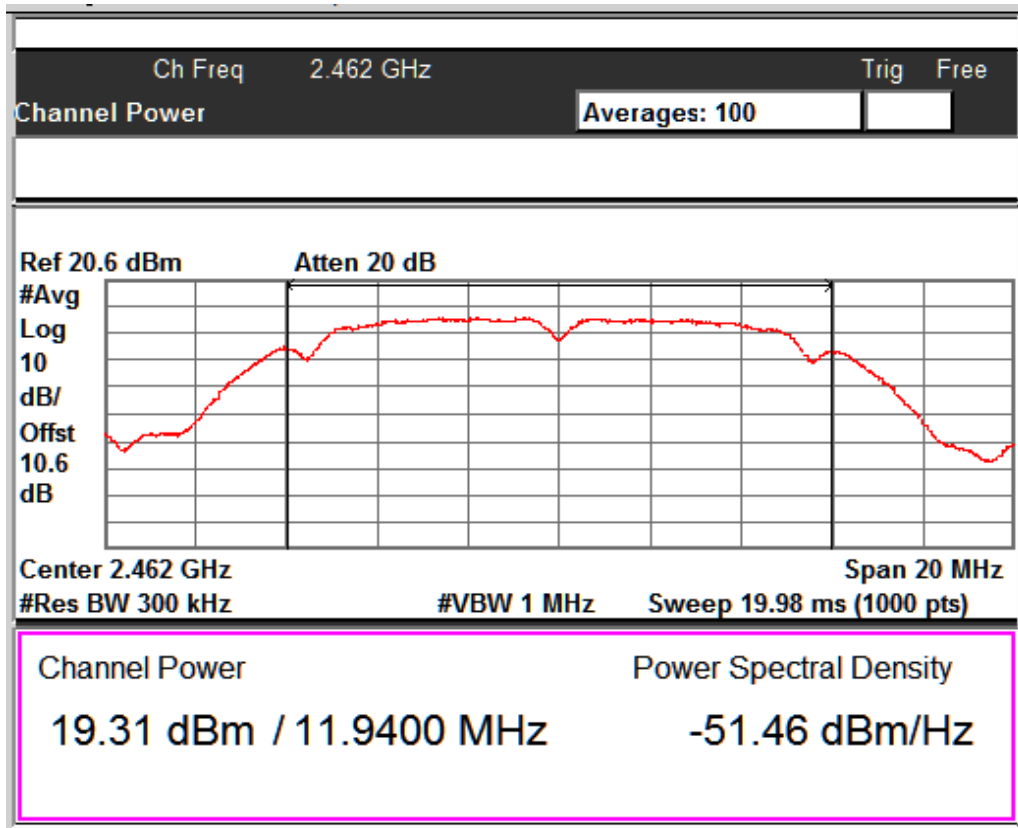
Channel Frequency: 2412 MHz



Data Rate: 1 Mbps

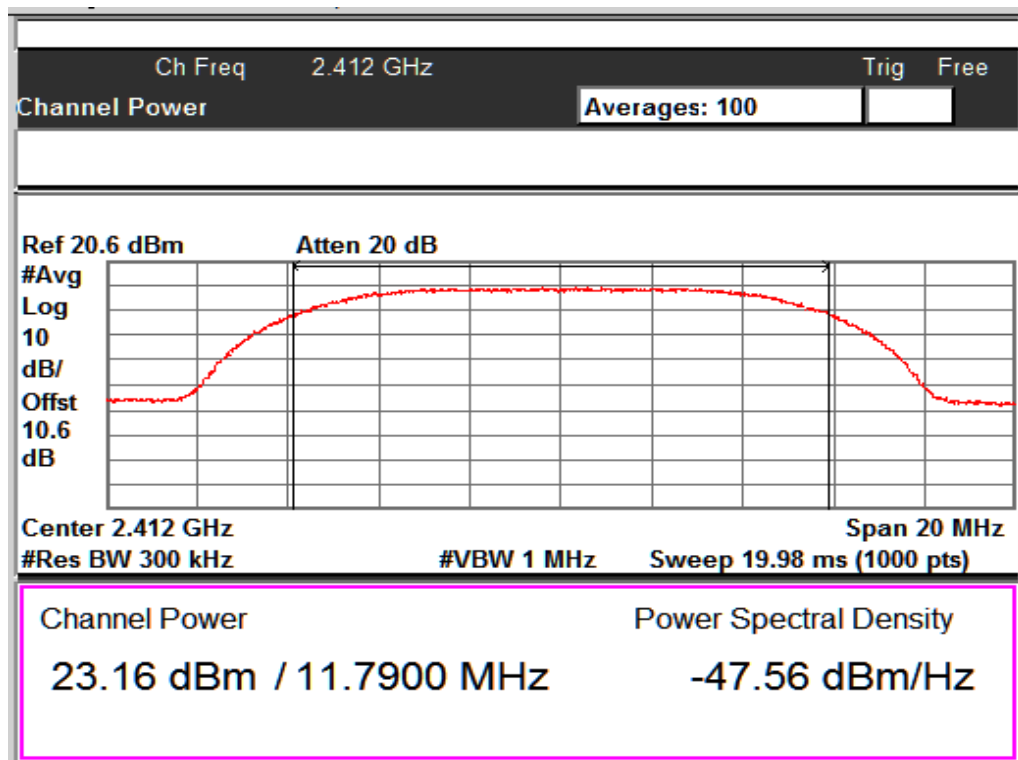
Channel Frequency: 2442 MHz

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Data Rate: 1 Mbps

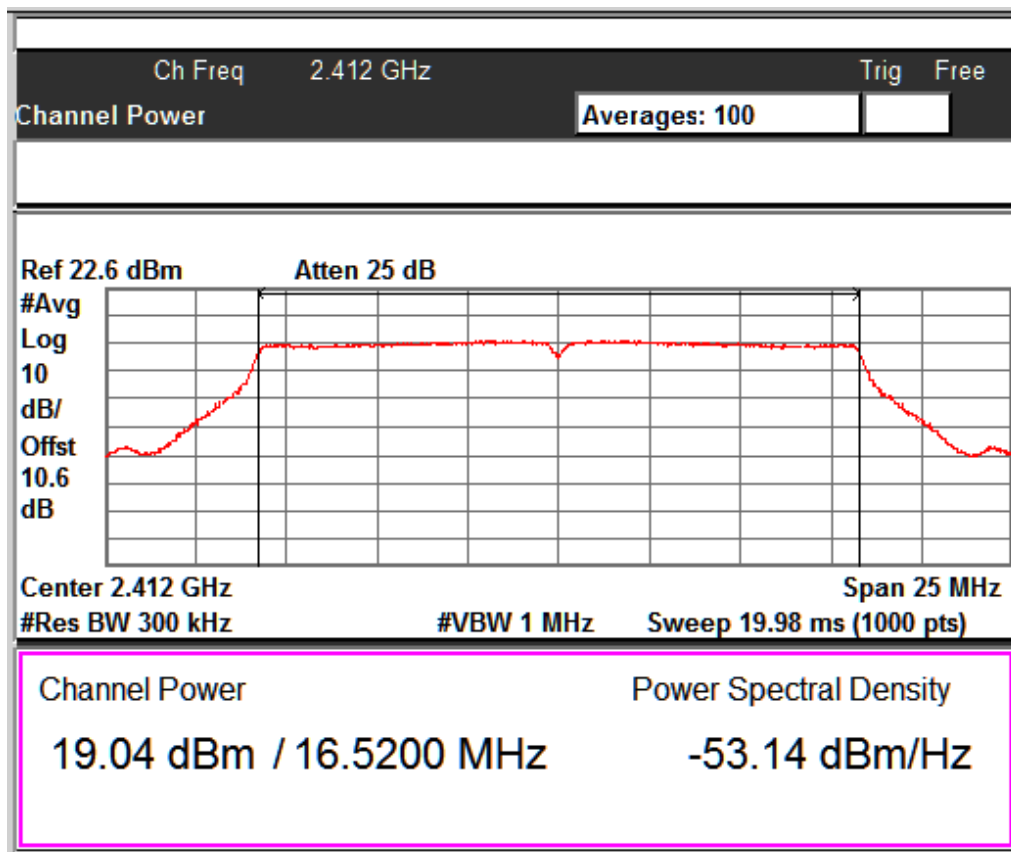
Channel Frequency: 2462 MHz



Data Rate: 11 Mbps

Channel Frequency: 2412 MHz

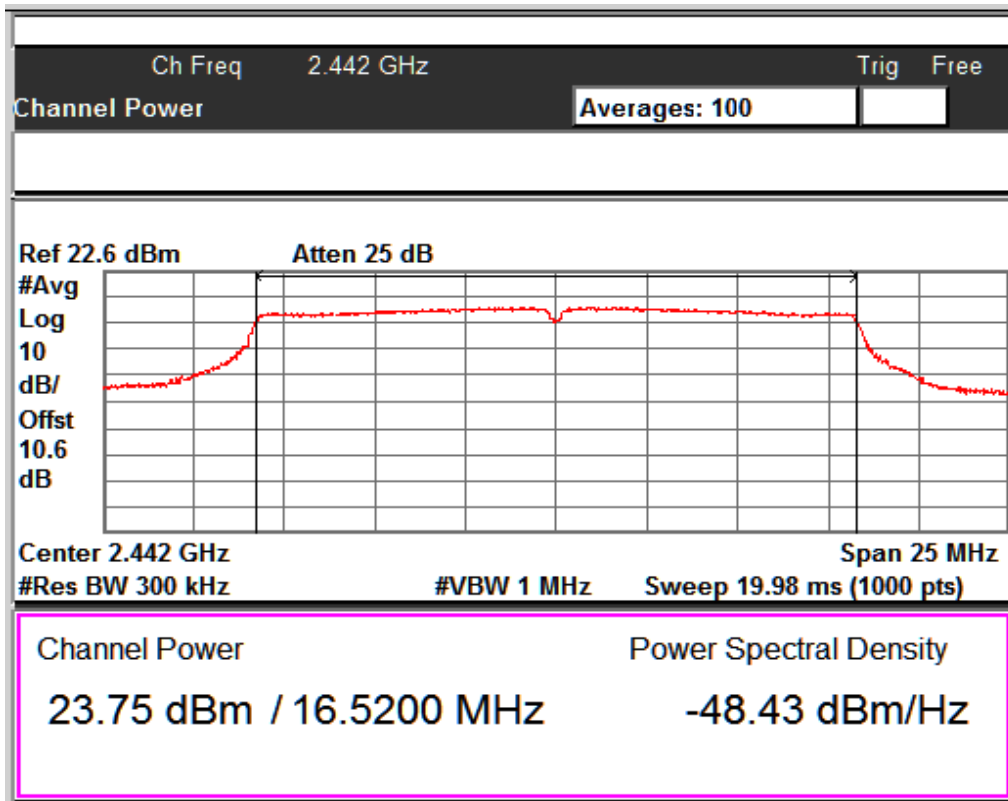
802.11 Protocol	Data Rate (Mbps)	Channel	Total Power (dBm)	Limit (dBm)	Margin (dB)
g Mode	6 Mbps	Low	19.04	30	-10.96
		Mid	23.75	30	-6.25
		High	18.42	30	-11.58
	24 Mbps	Low	19.24	30	-10.76
		Mid	22.89	30	-7.11
		High	18.51	30	-11.49
	54 Mbps	Low	18.87	30	-11.13
		Mid	23.74	30	-6.26
		High	17.84	30	-12.16



Data Rate: 6 Mbps

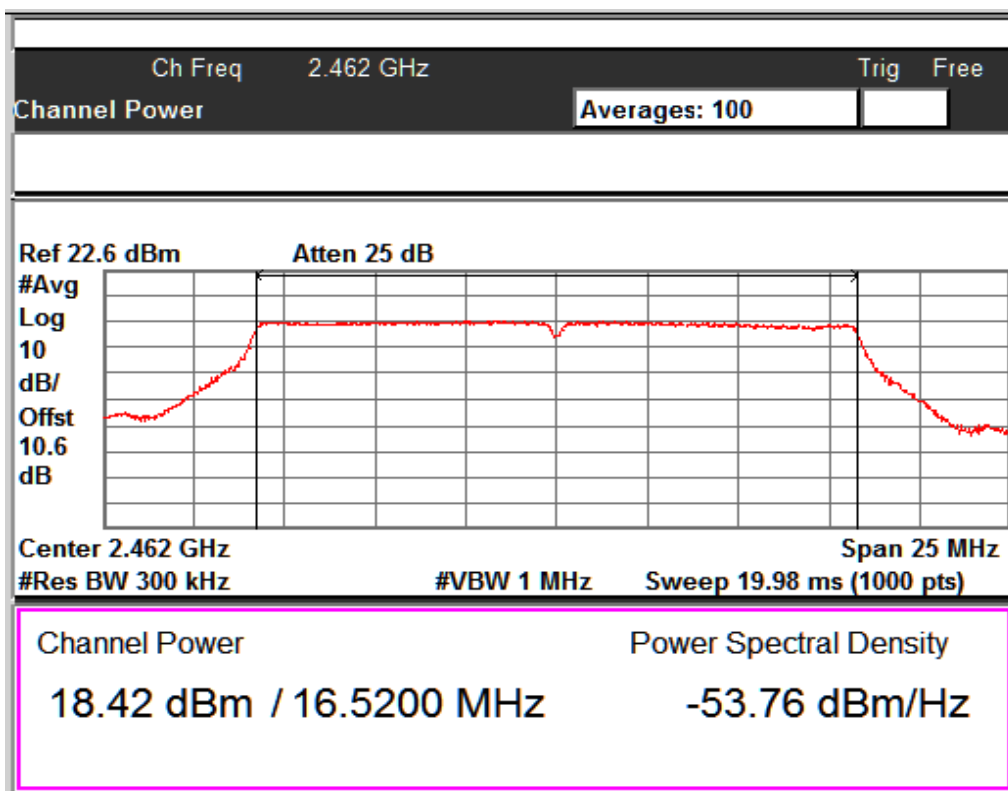
Channel Frequency: 2412 MHz

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Data Rate: 6 Mbps

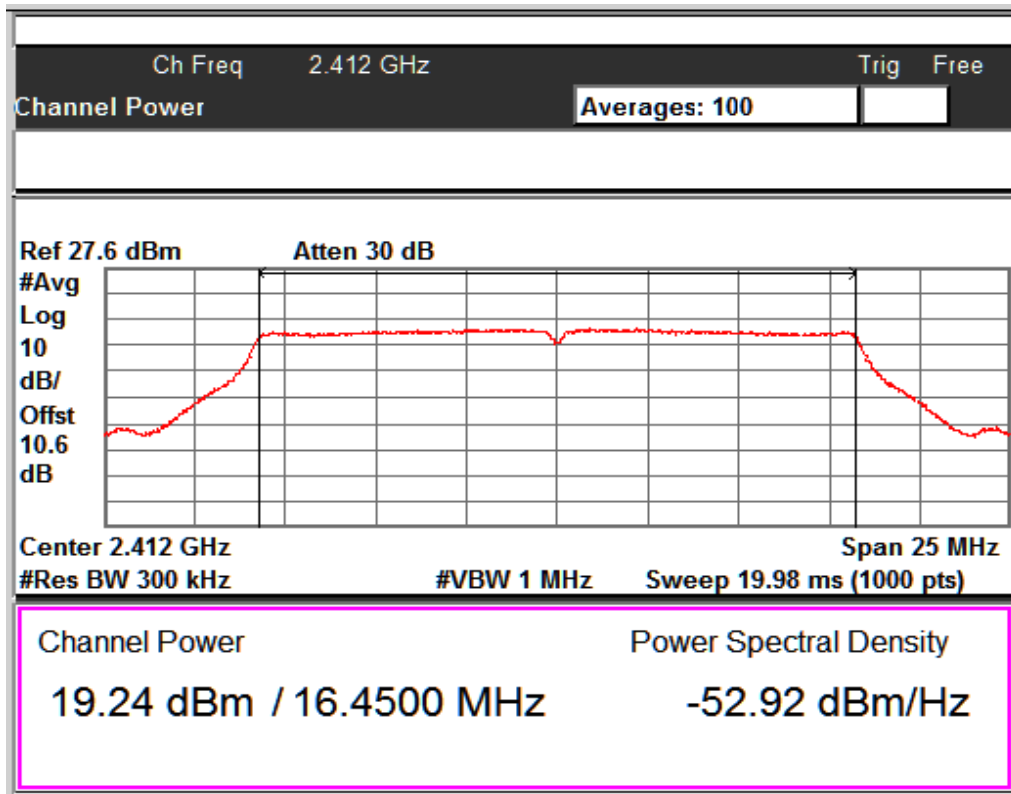
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Data Rate: 6 Mbps

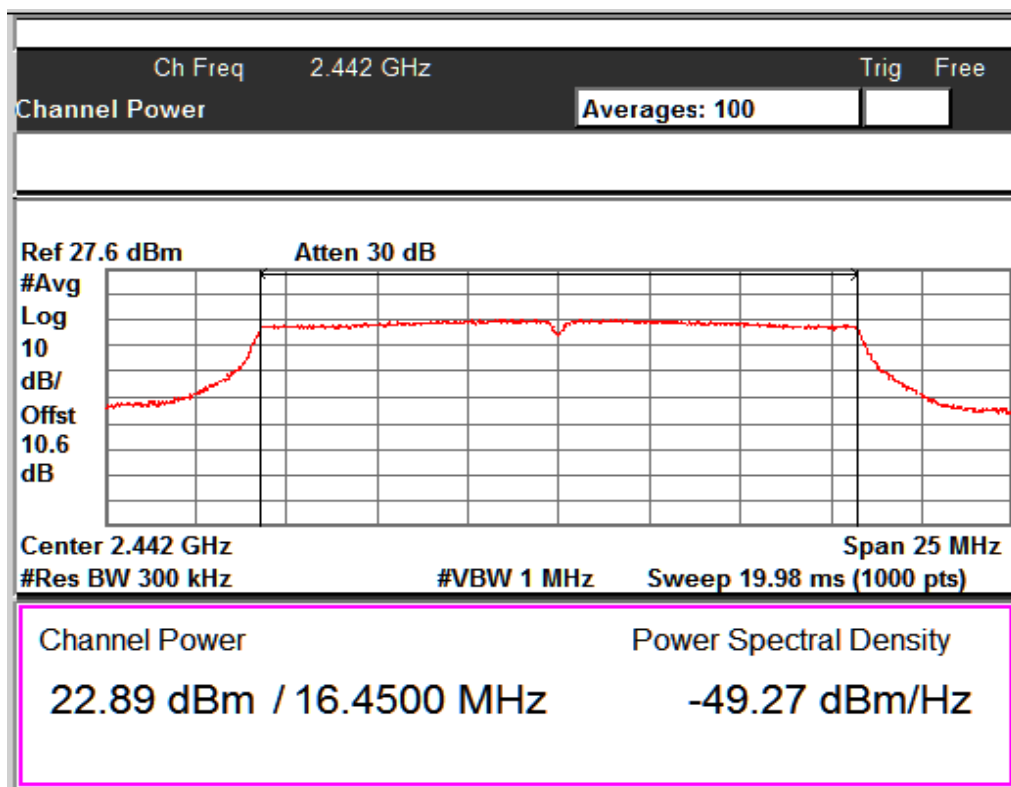
Channel Frequency: 2462 MHz

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Data Rate: 24 Mbps

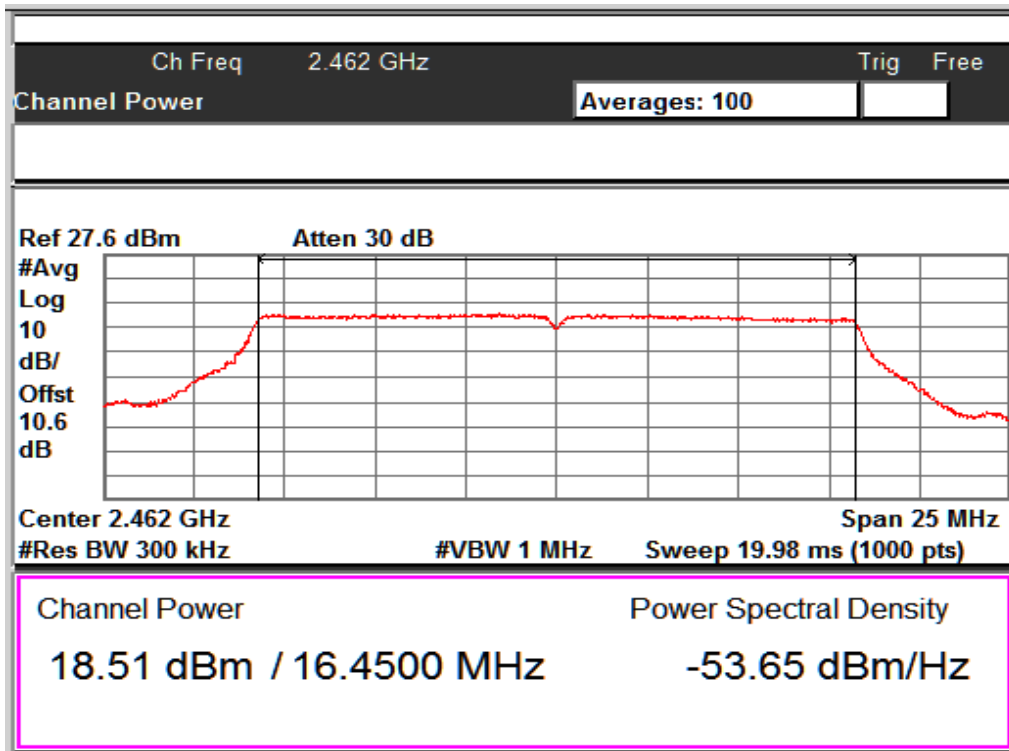
Channel Frequency: 2412 MHz



Data Rate: 24 Mbps

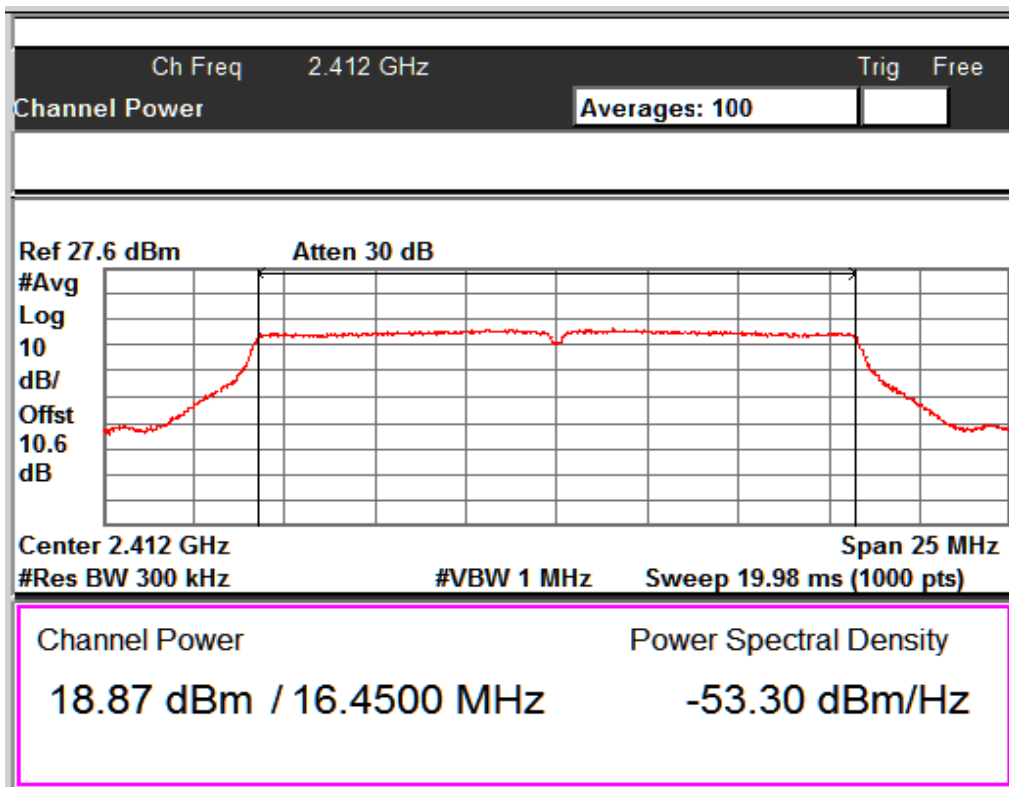
Channel Frequency: 2442 MHz

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Data Rate: 24 Mbps

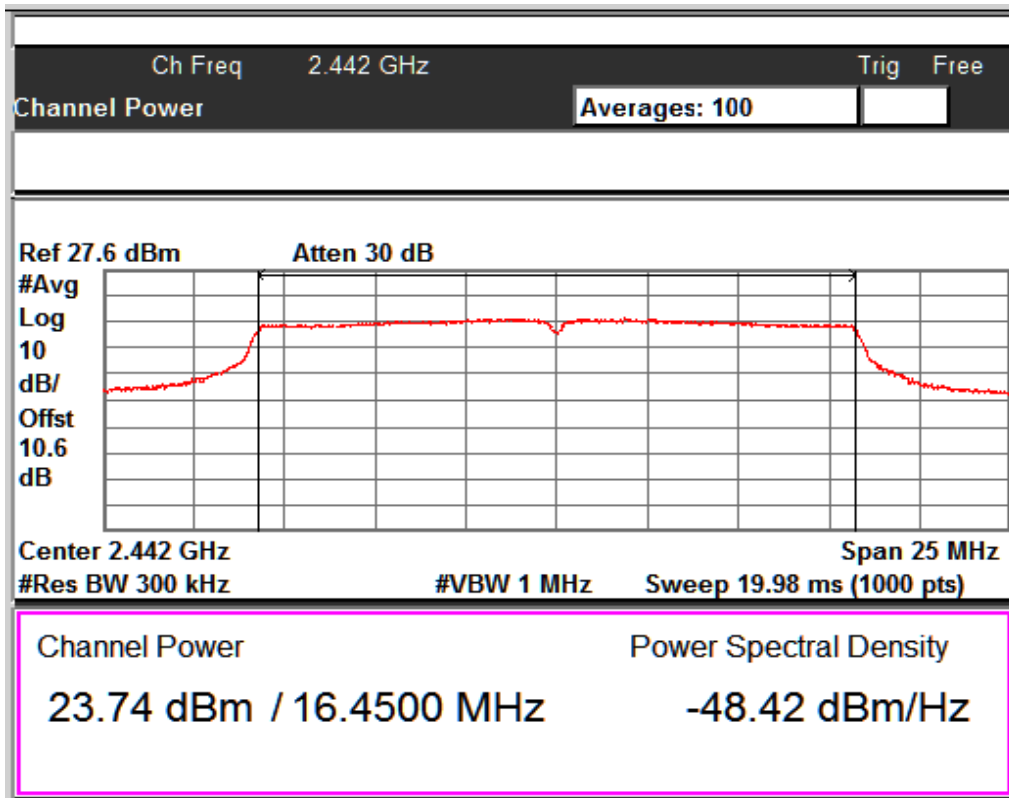
Channel Frequency: 2462 MHz



Data Rate: 54 Mbps

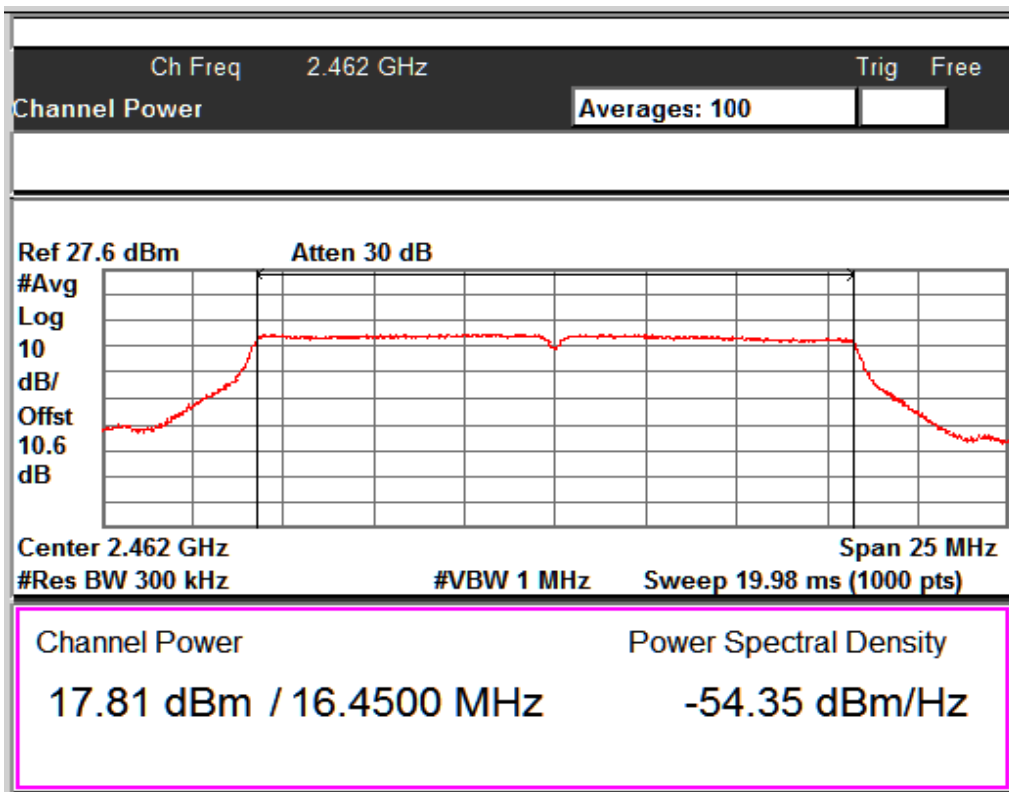
Channel Frequency: 2412 MHz

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Data Rate: 54 Mbps

Channel Frequency: 2442 MHz

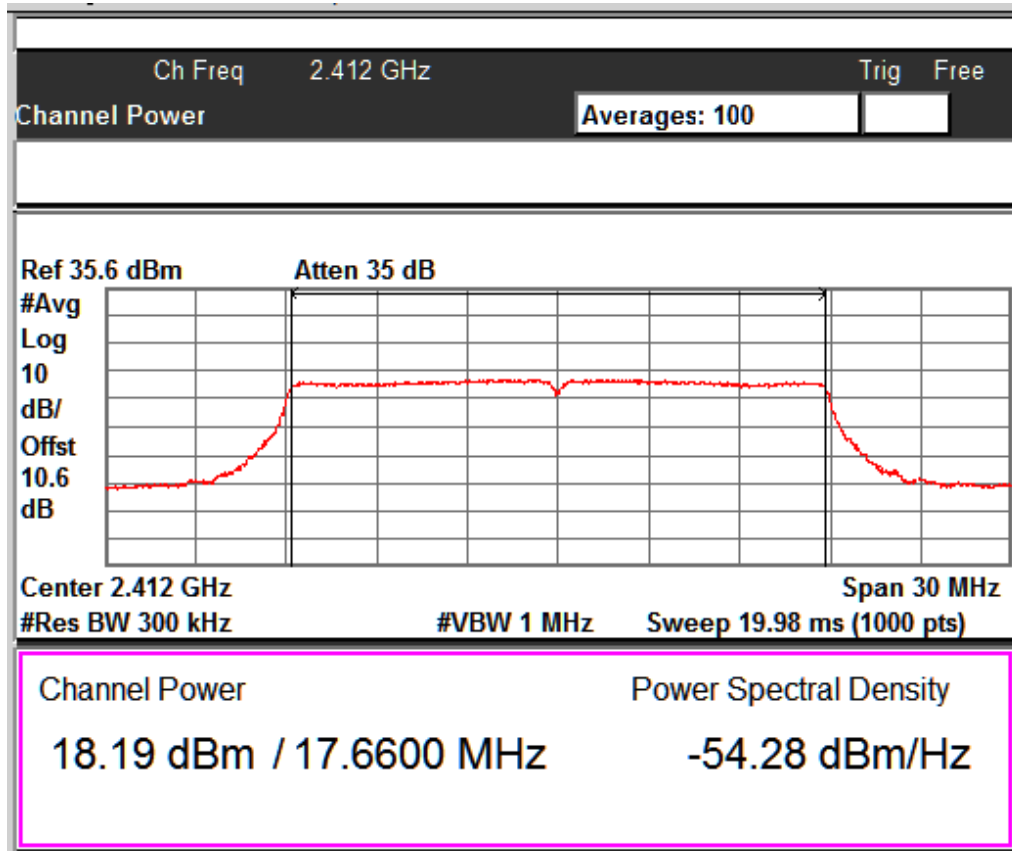


Data Rate: 54 Mbps

Channel Frequency: 2462 MHz

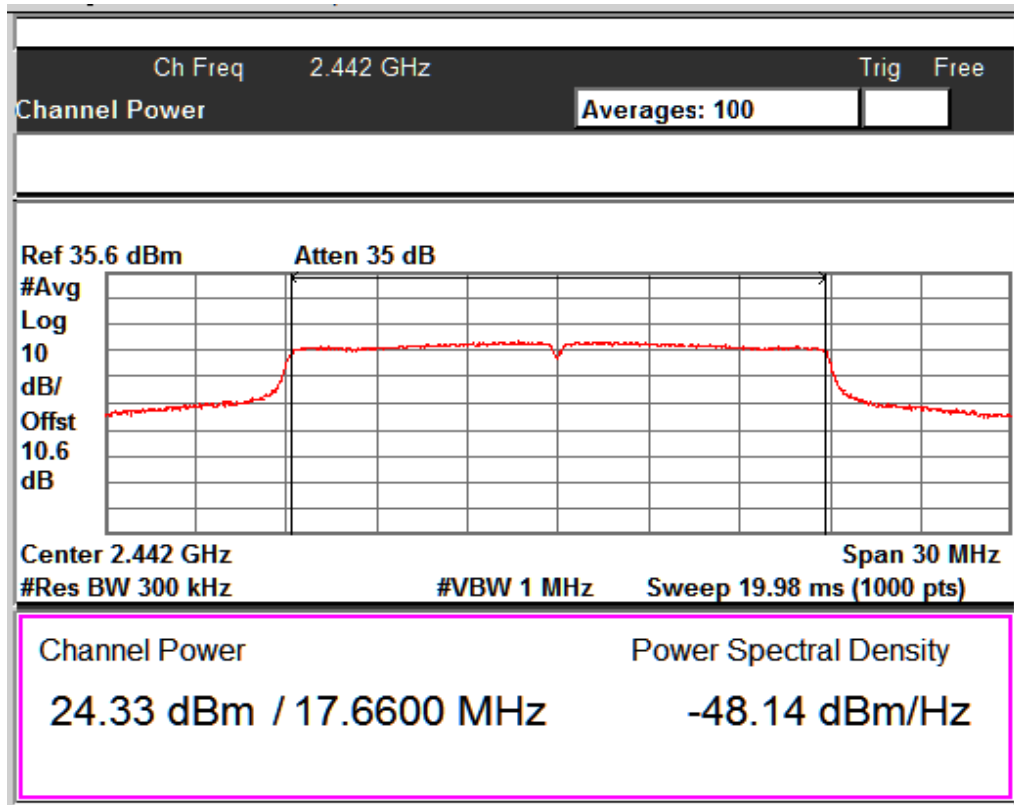
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Result: n Mode

802.11 Protocol	Data Rate (Mbps)	Channel	Total Power (dBm)	Limit (dBm)	Margin (dB)
n Mode	MCS 0	Low	18.19	30	-11.81
		Mid	24.33	30	-5.67
		High	17.45	30	-12.55
	MCS 4	Low	18.44	30	-11.56
		Mid	24.47	30	-5.53
		High	17.66	30	-12.34
	MCS 7	Low	18.04	30	-11.96
		Mid	24.22	30	-5.78
		High	17.52	30	-12.48



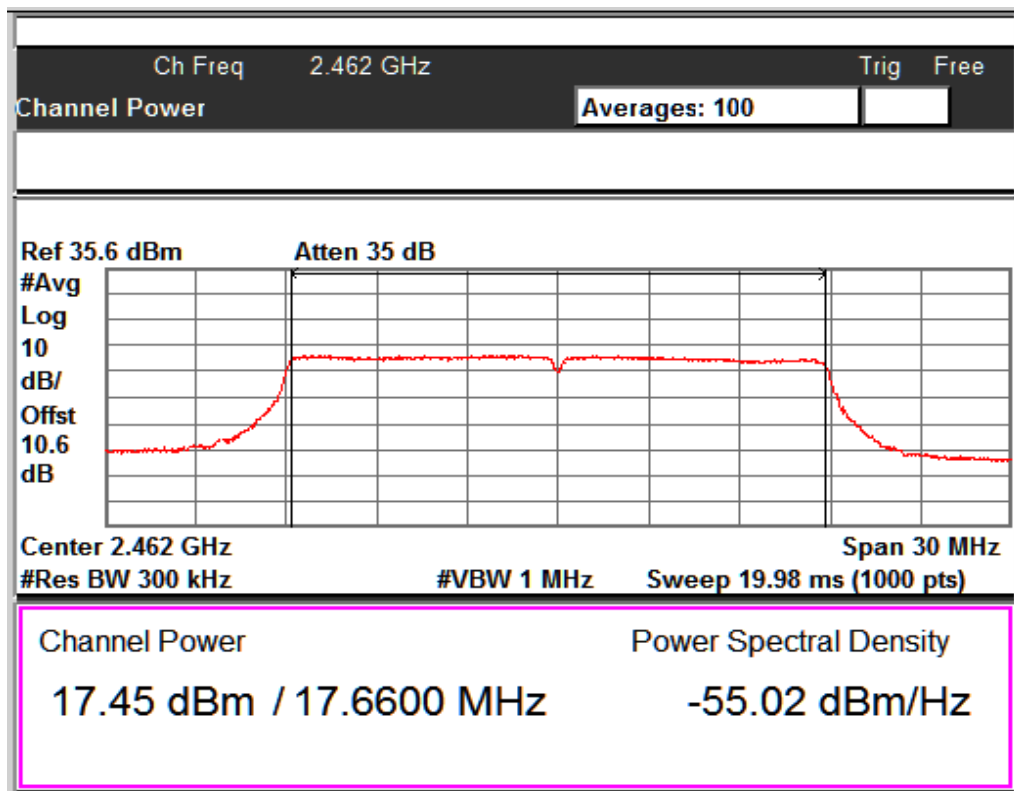
Data Rate: MCS 0

Channel Frequency: 2412 MHz



Data Rate: MCS 0

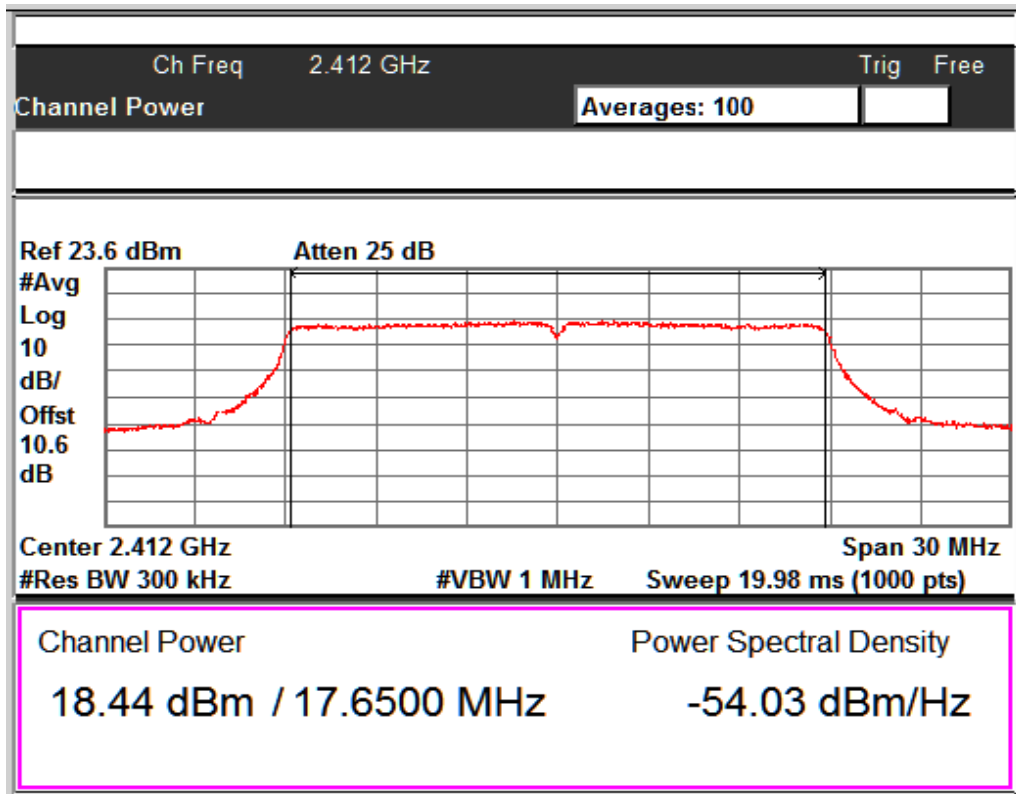
Channel Frequency: 2442 MHz



Data Rate: MCS 0

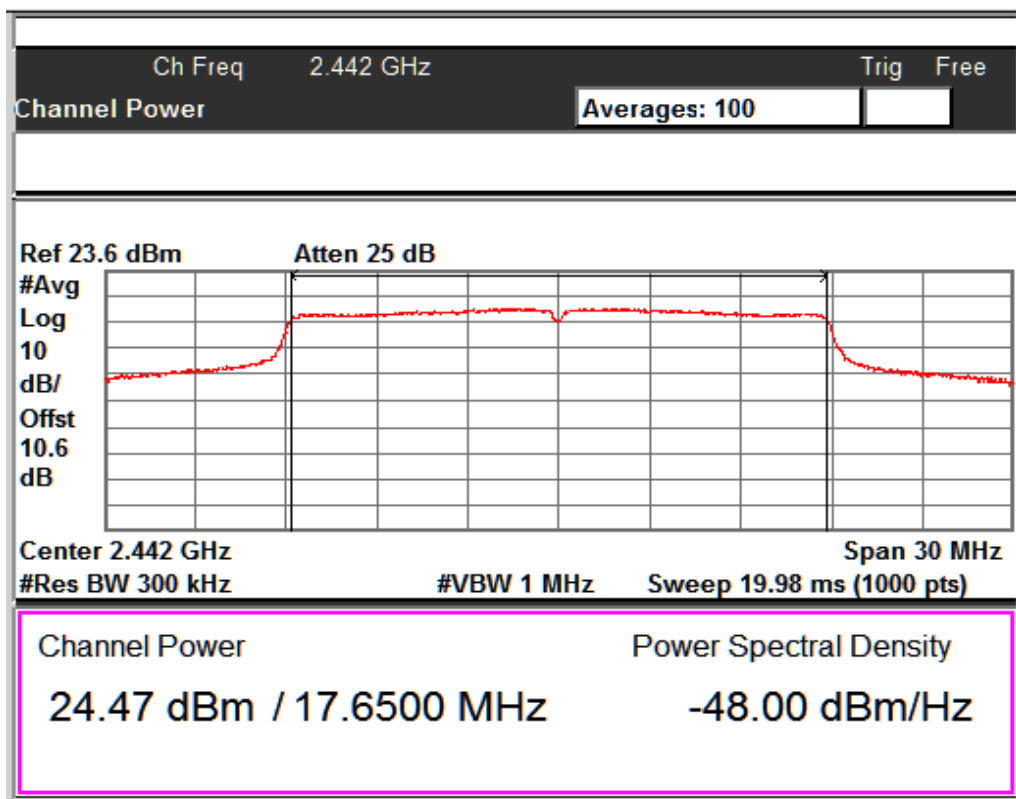
Channel Frequency: 2462 MHz

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Data Rate: MCS 4

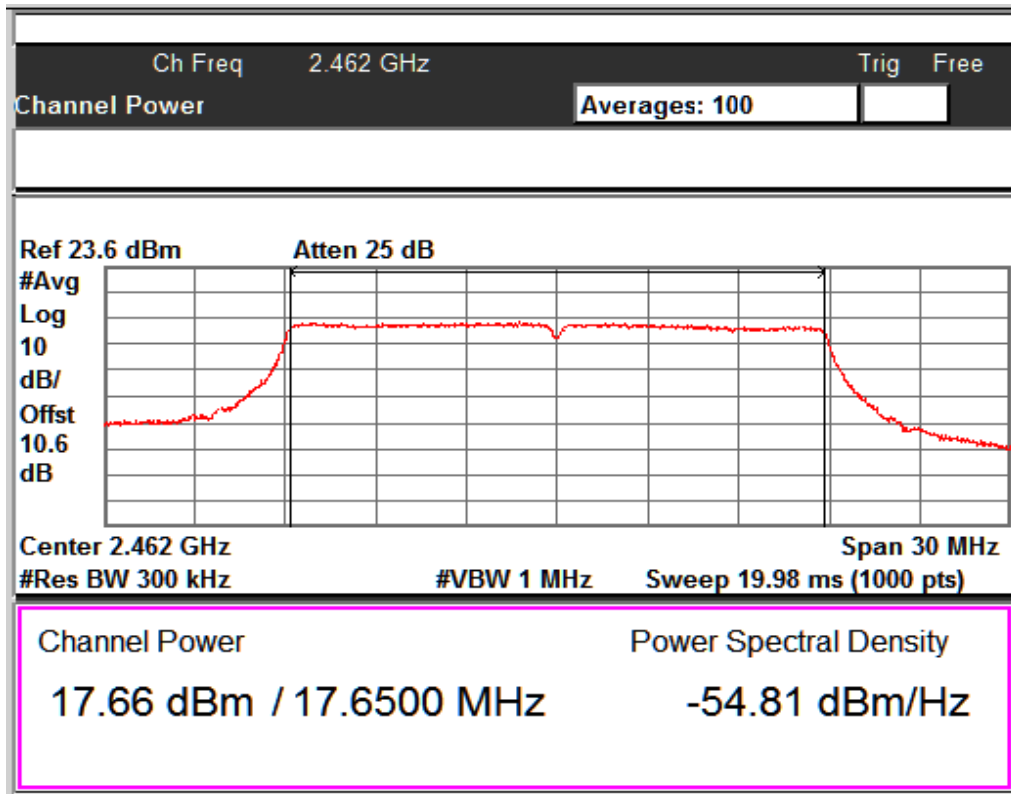
Channel Frequency: 2412 MHz



Data Rate: MCS 4

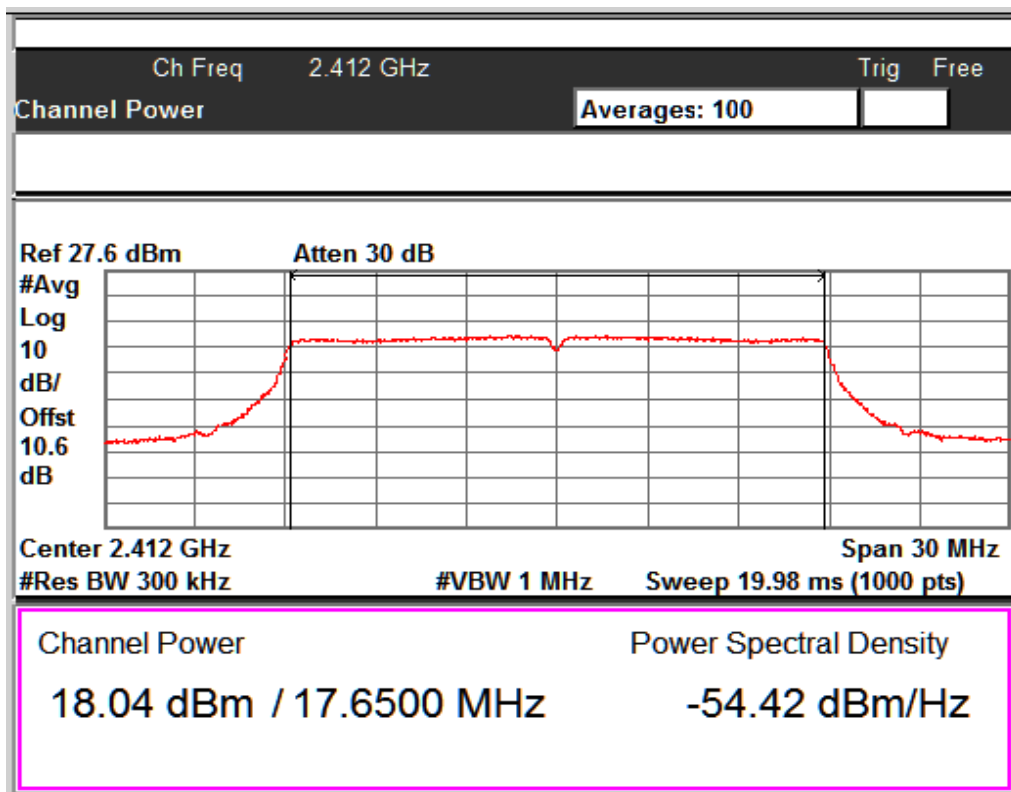
Channel Frequency: 2442 MHz

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Data Rate: MCS 4

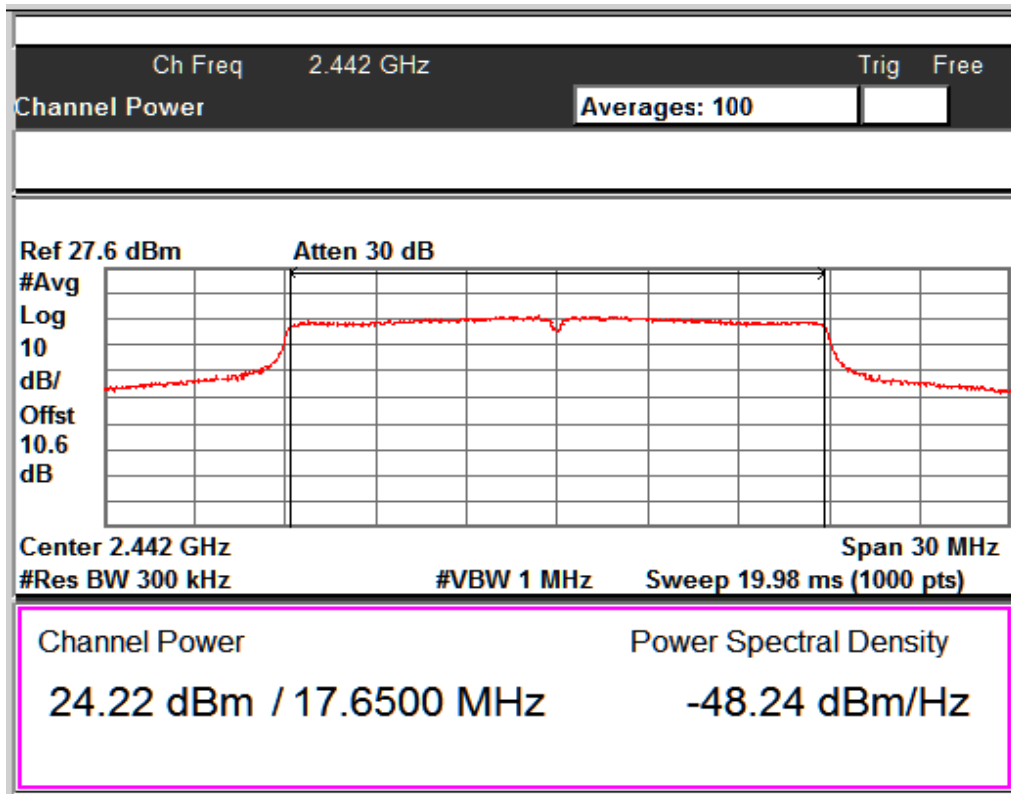
Channel Frequency: 2462 MHz



Data Rate: MCS 7

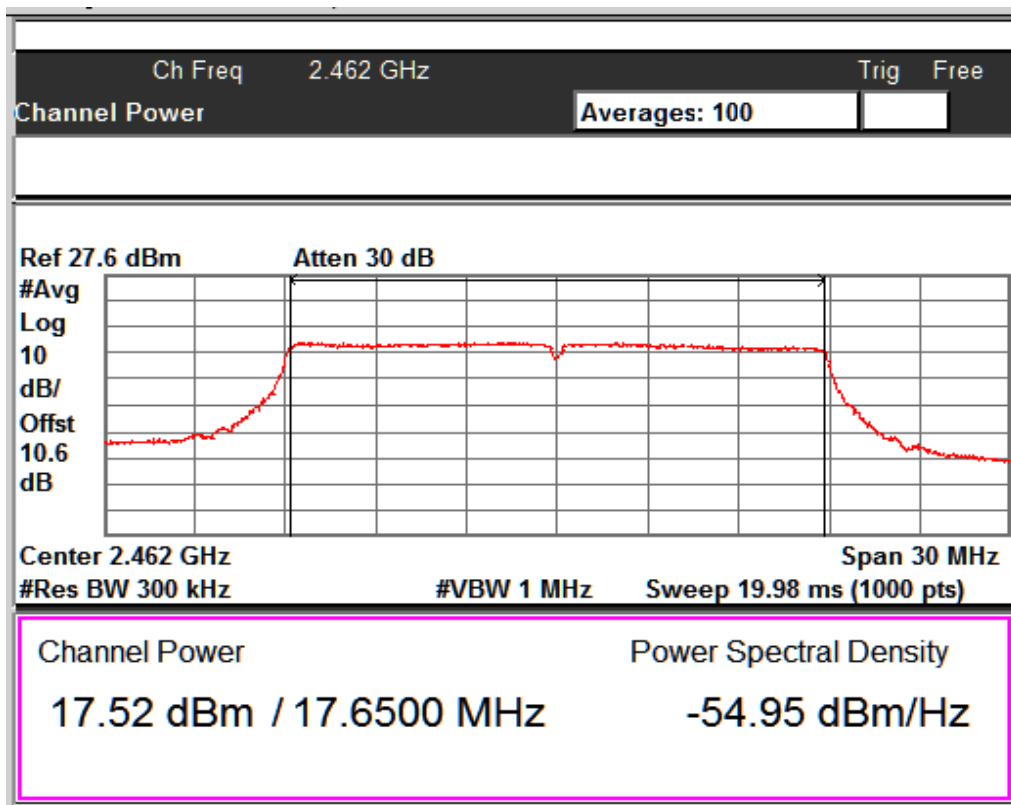
Channel Frequency: 2412 MHz

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Data Rate: MCS 7

Channel Frequency: 2442 MHz



Data Rate: MCS 7

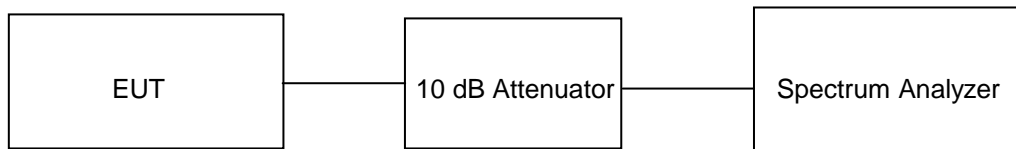
Channel Frequency: 2462 MHz

Result
Pass

Test Specification FCC Part 15 Section 15.247 (e)
 Detector Function Average
 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.

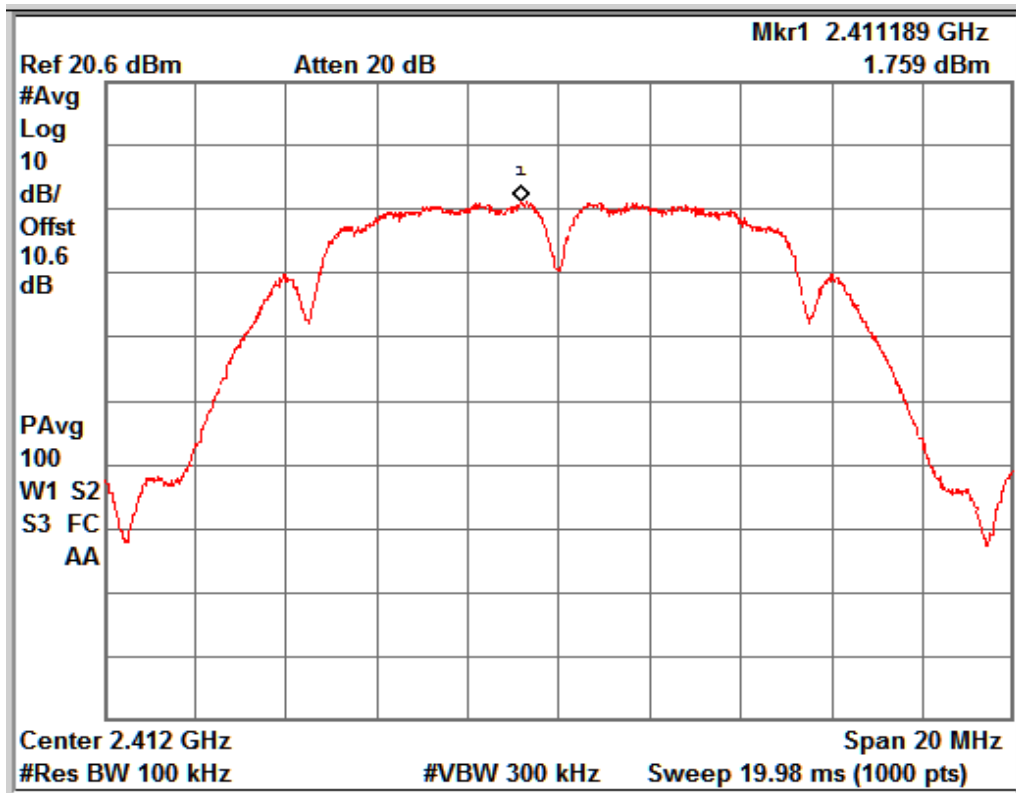
Note: For measurement of Maximum power spectral density option 1 was used

Test Method:

Test Result: b Mode

Cable Loss (0.6dB) + Attenuator (10 dB): 10.6 dB (Included in the test results)

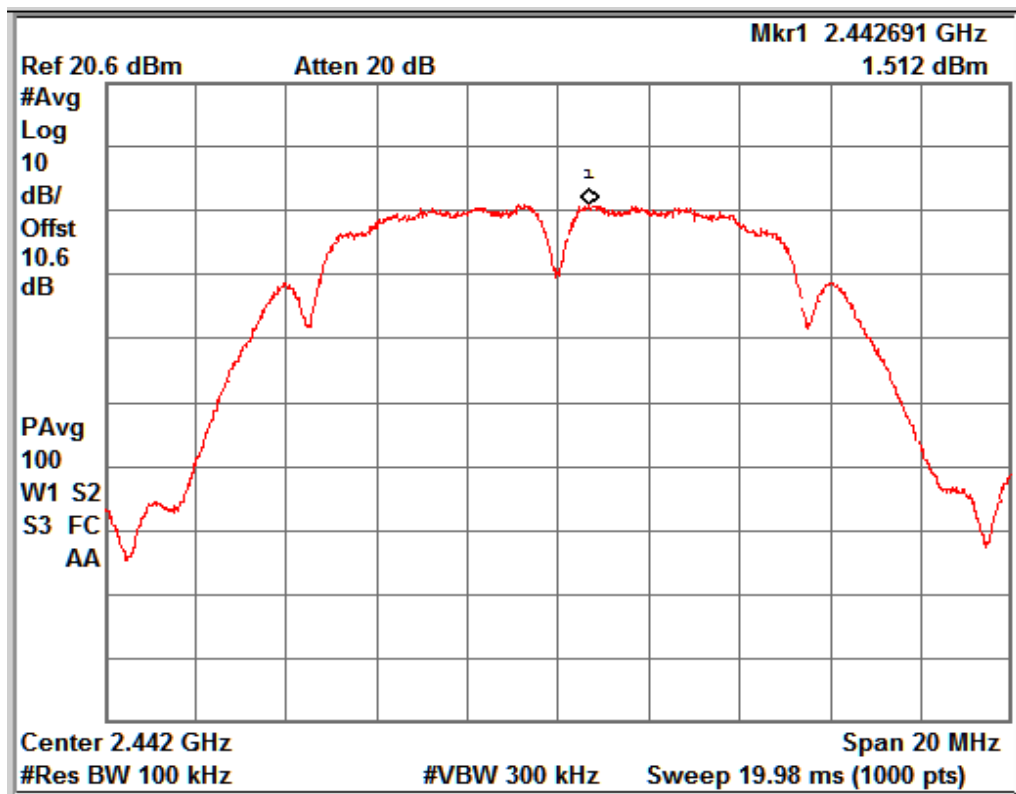
802.11 Protocol	Data Rate (Mbps)	Channel	Total PSD (dBm)	Limit (dBm)	Margin (dB)
b Mode	1	Low	1.76	8	-6.24
		Mid	1.51	8	-6.49
		High	1.93	8	-6.07
	11	Low	5.31	8	-2.69
		Mid	6.85	8	-1.15
		High	4.41	8	-3.59

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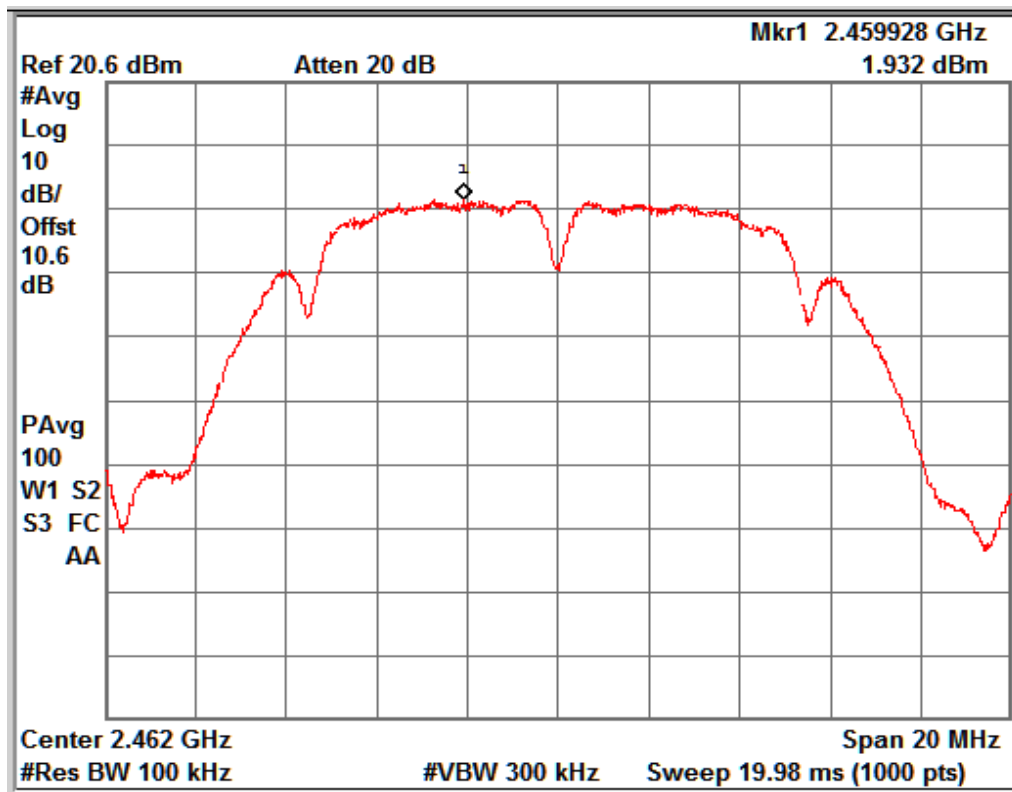
Data Rate: 1 Mbps

Channel Frequency: 2412 MHz



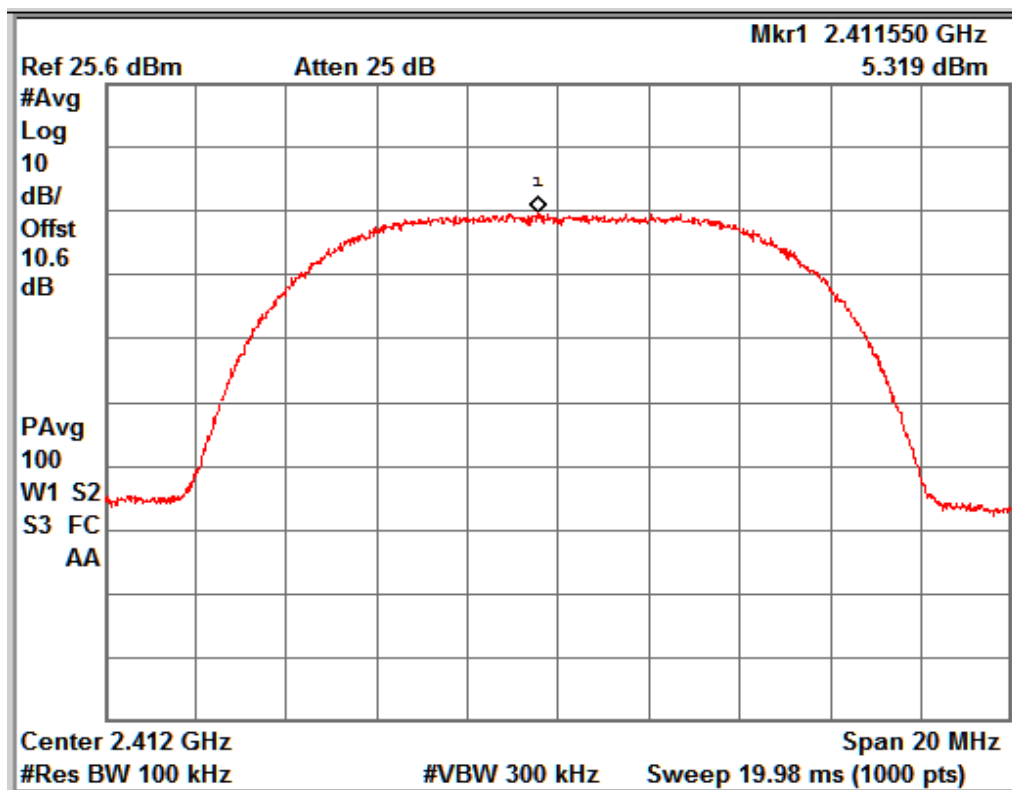
Data Rate: 1 Mbps

Channel Frequency: 2442 MHz



Data Rate: 1 Mbps

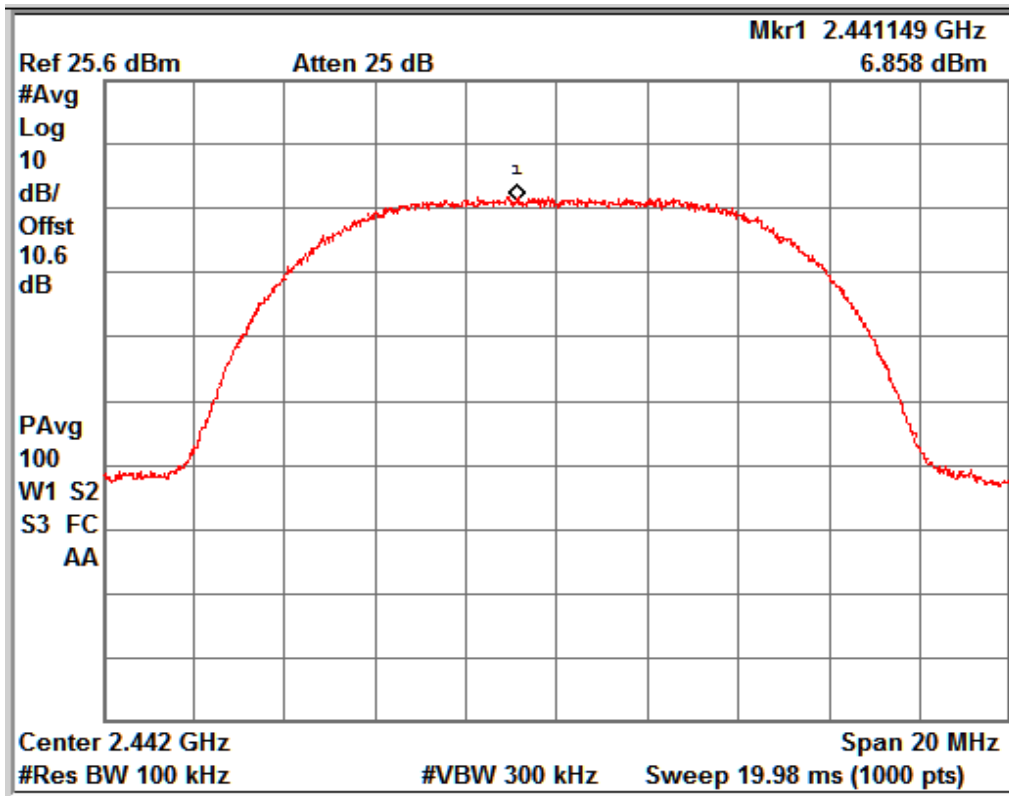
Channel Frequency: 2462 MHz



Data Rate: 11 Mbps

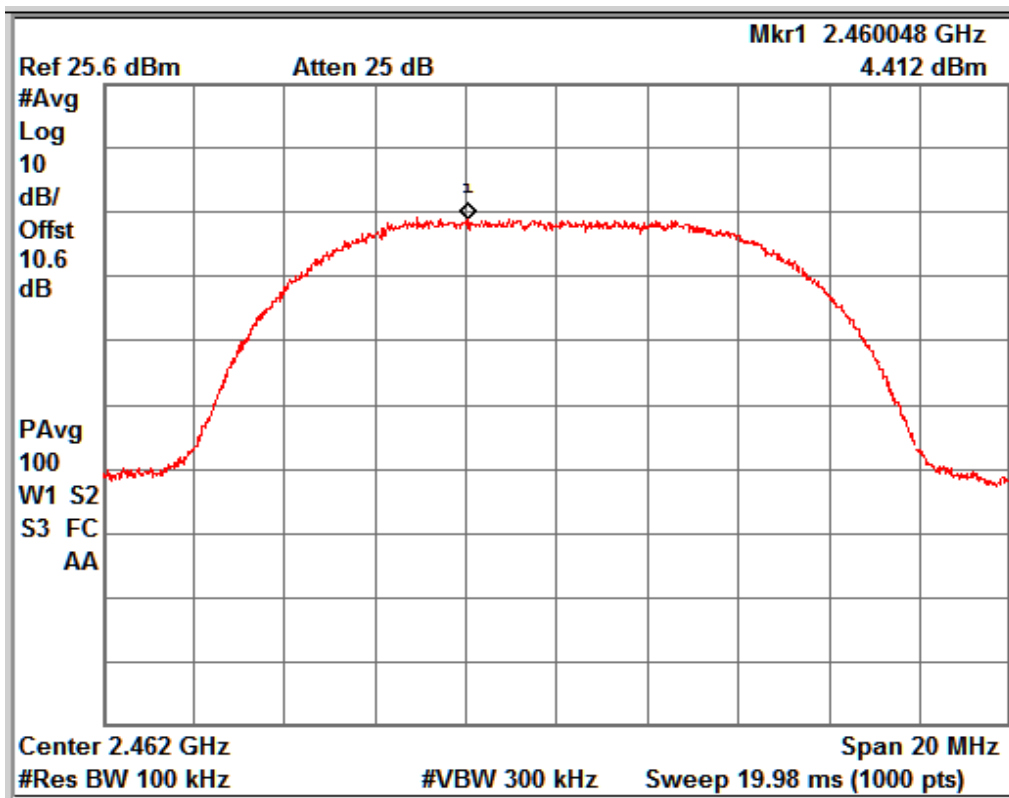
Channel Frequency: 2412 MHz

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Data Rate: 11 Mbps

Channel Frequency: 2442 MHz

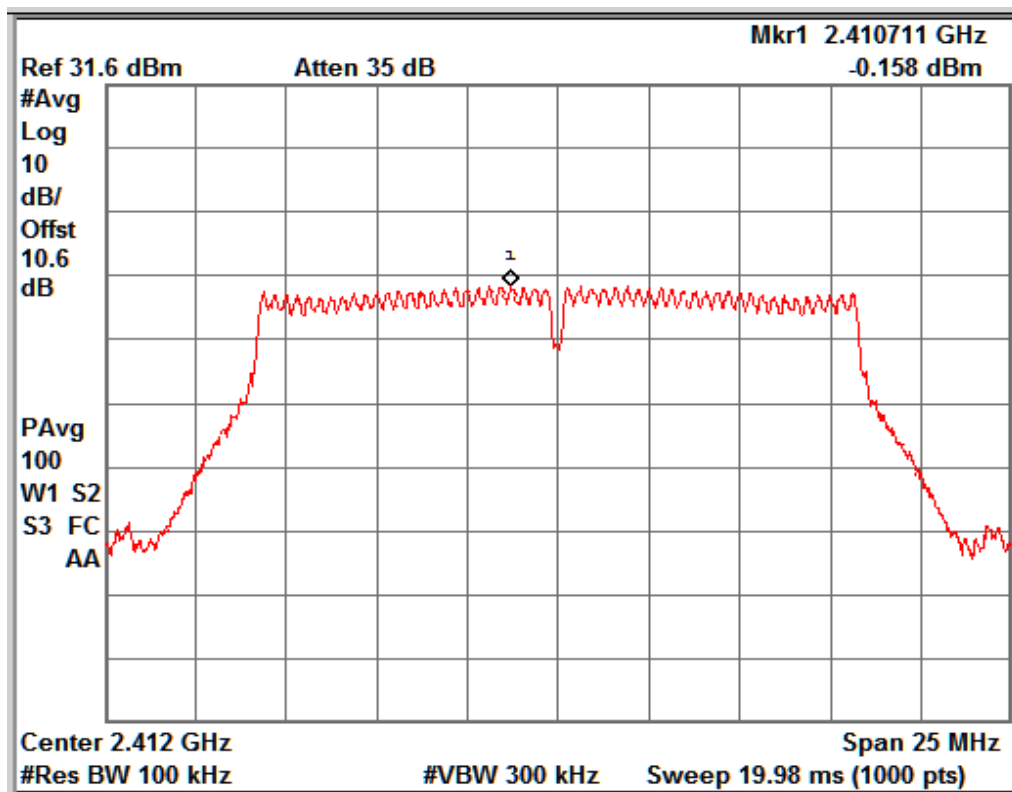


Data Rate: 11 Mbps

Channel Frequency: 2462 MHz

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Result: g Mode

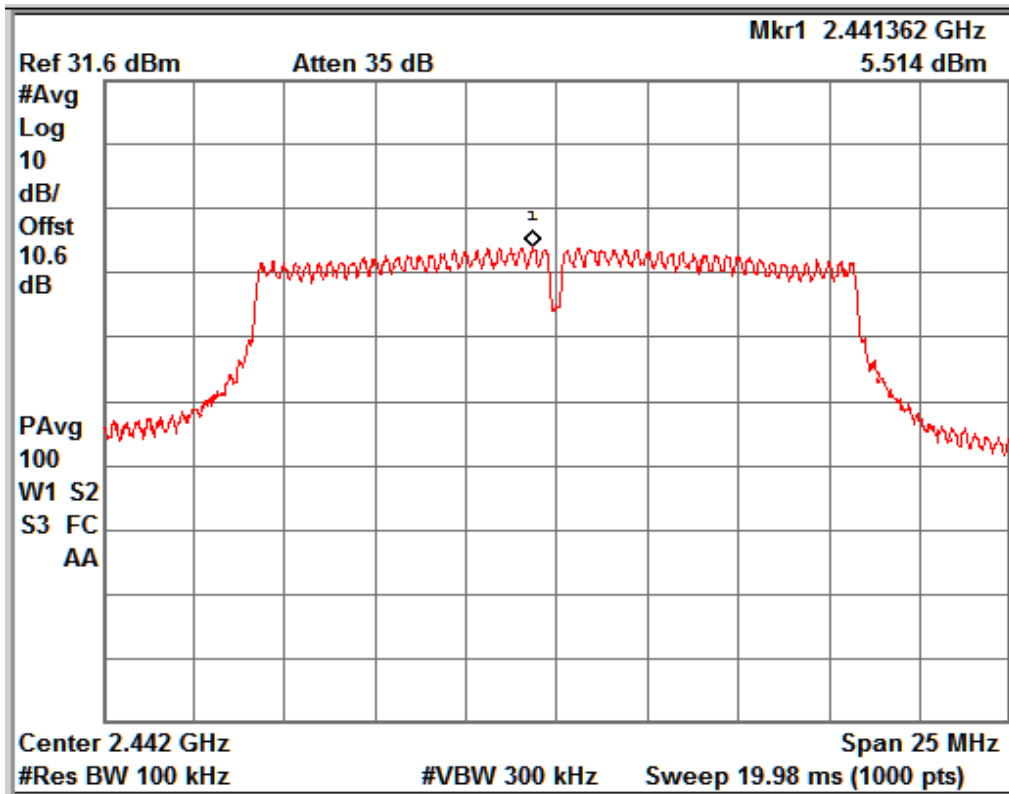
802.11 Protocol	Data Rate (Mbps)	Channel	Total PSD (dBm)	Limit (dBm)	Margin (dB)
g Mode	6	Low	-0.15	8	-8.15
		Mid	5.51	8	-2.49
		High	-0.90	8	-8.90
	24	Low	-0.10	8	-8.10
		Mid	5.72	8	-2.28
		High	-1.22	8	-9.22
	54	Low	0.07	8	-7.94
		Mid	5.21	8	-2.79
		High	-1.55	8	-9.55



Data Rate: 6 Mbps

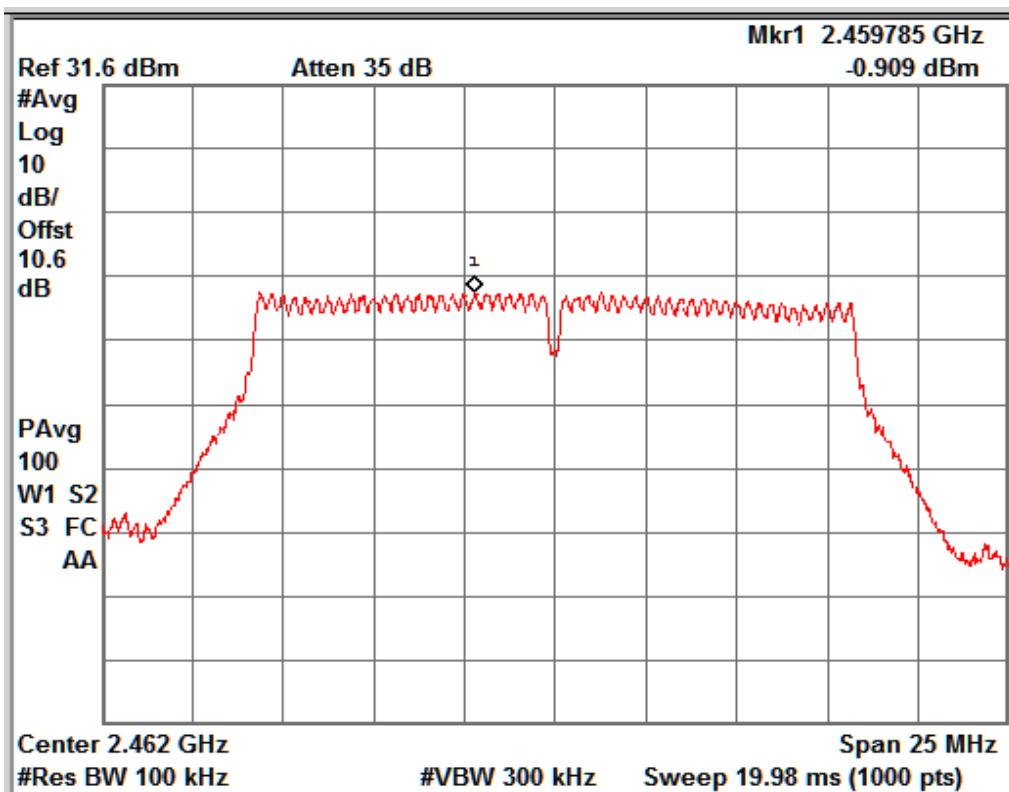
Channel Frequency: 2412 MHz

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Data Rate: 6 Mbps

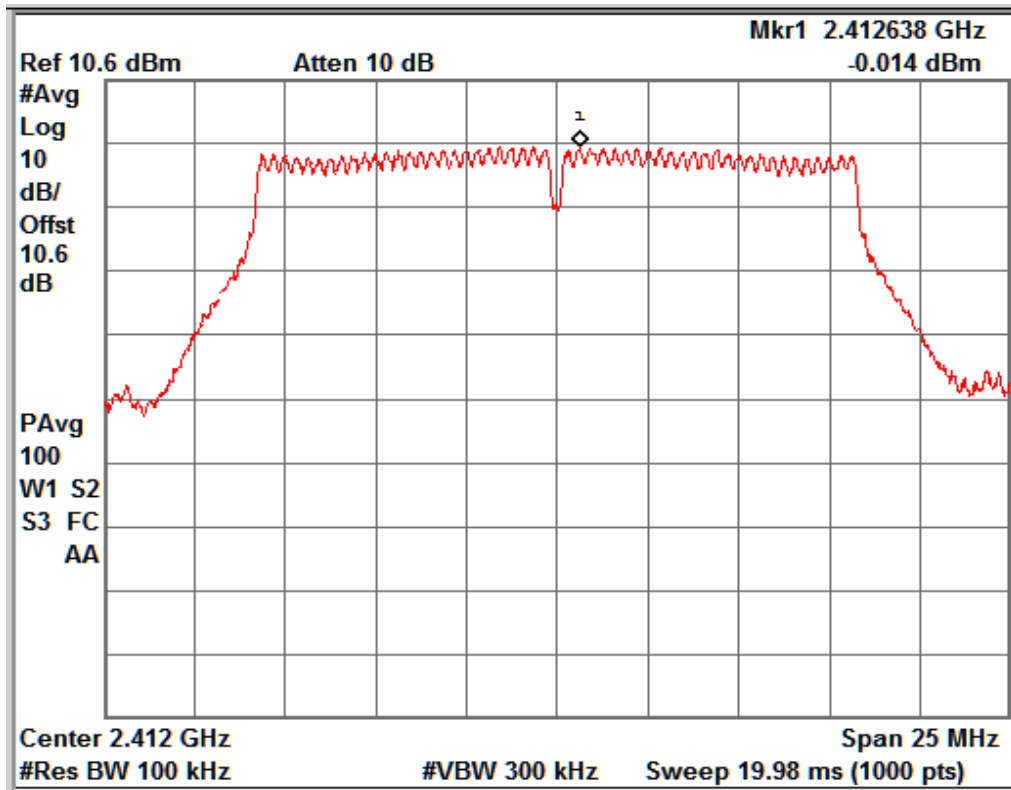
Channel Frequency: 2442 MHz



Data Rate: 6 Mbps

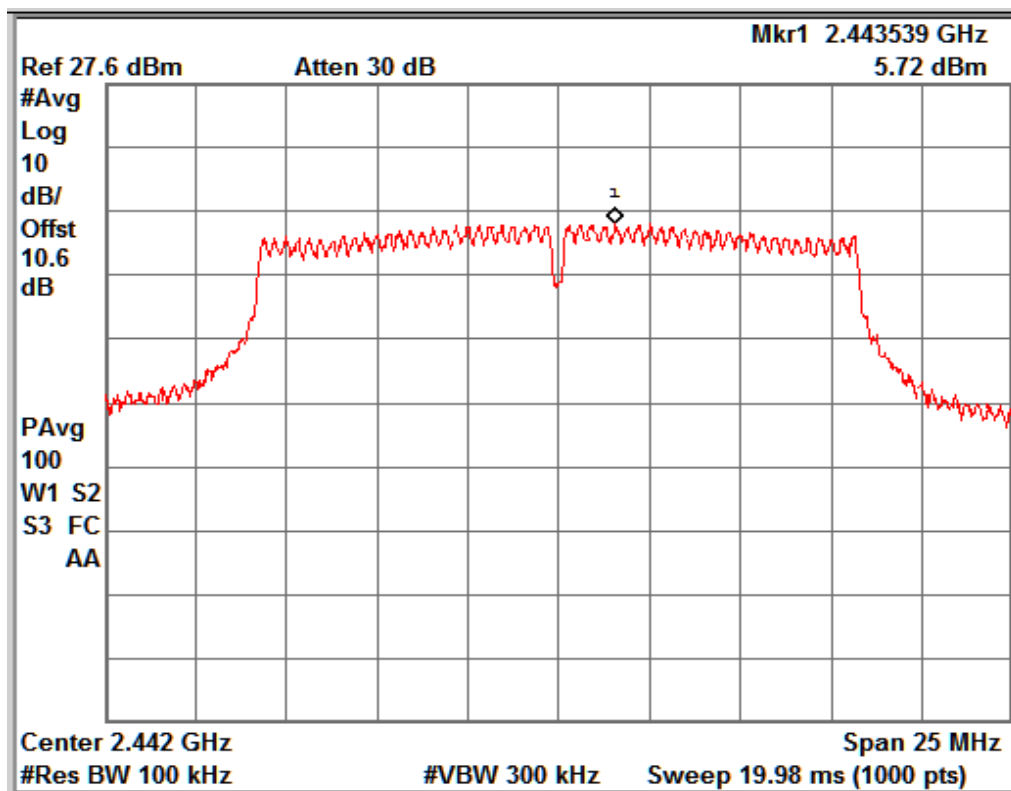
Channel Frequency: 2462 MHz

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Data Rate: 24 Mbps

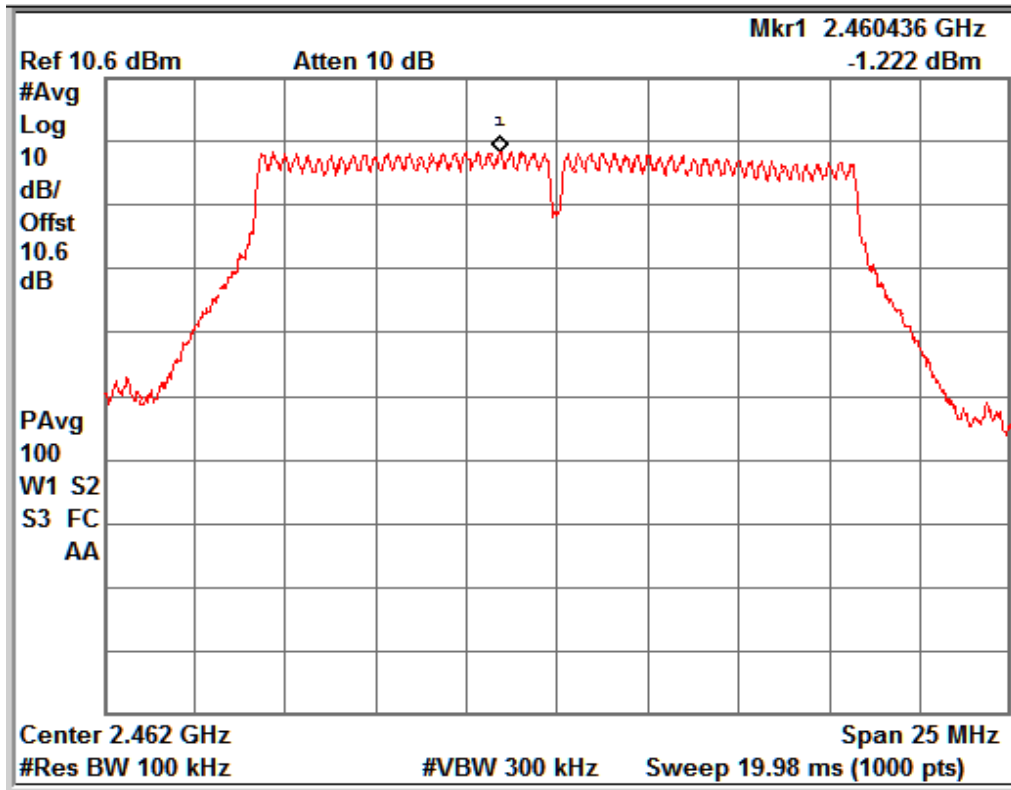
Channel Frequency: 2412 MHz



Data Rate: 24 Mbps

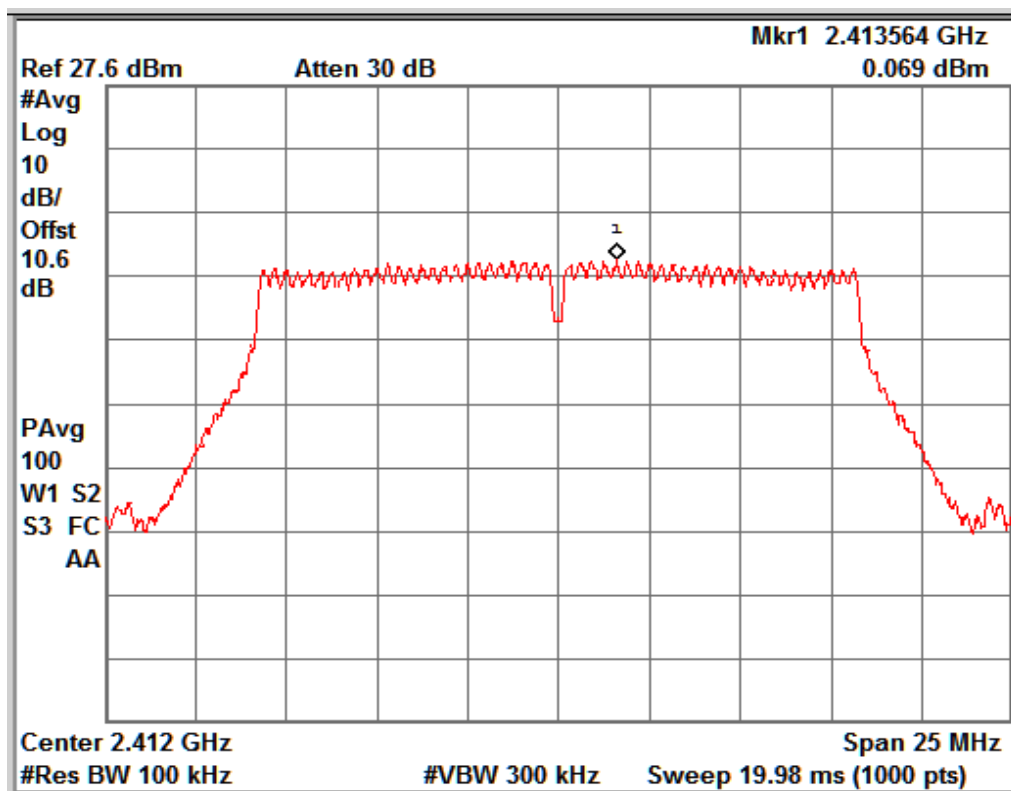
Channel Frequency: 2442 MHz

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Data Rate: 24 Mbps

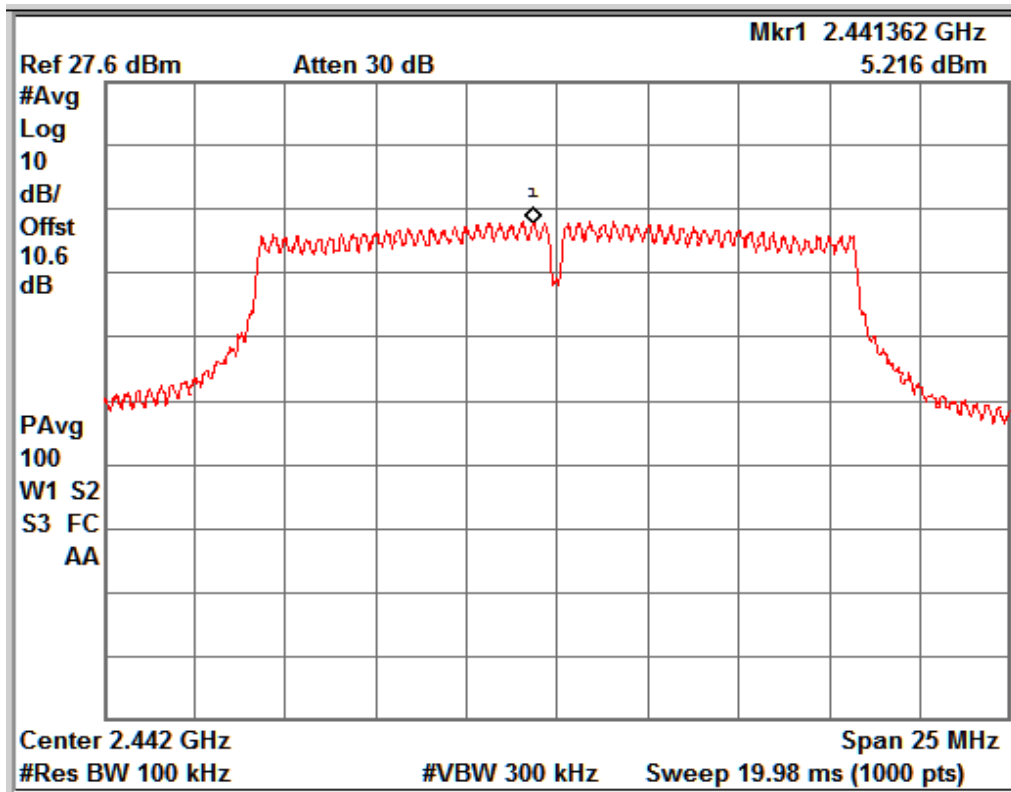
Channel Frequency: 2462 MHz



Data Rate: 54 Mbps

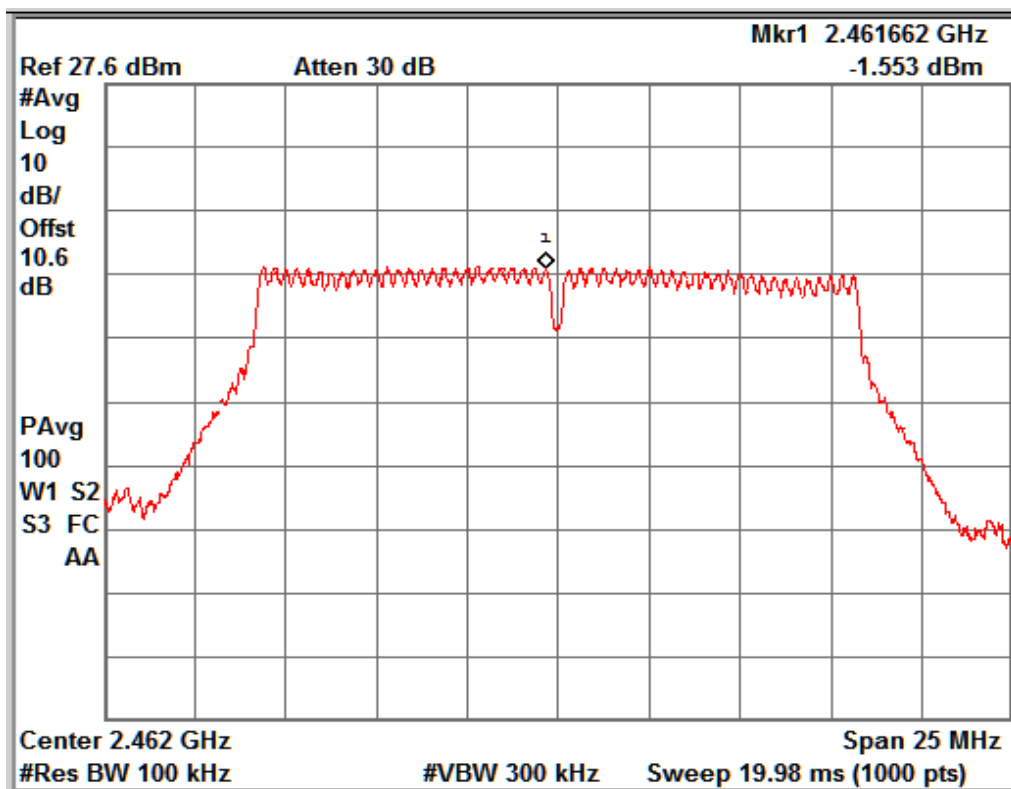
Channel Frequency: 2412 MHz

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Data Rate: 54 Mbps

Channel Frequency: 2442 MHz

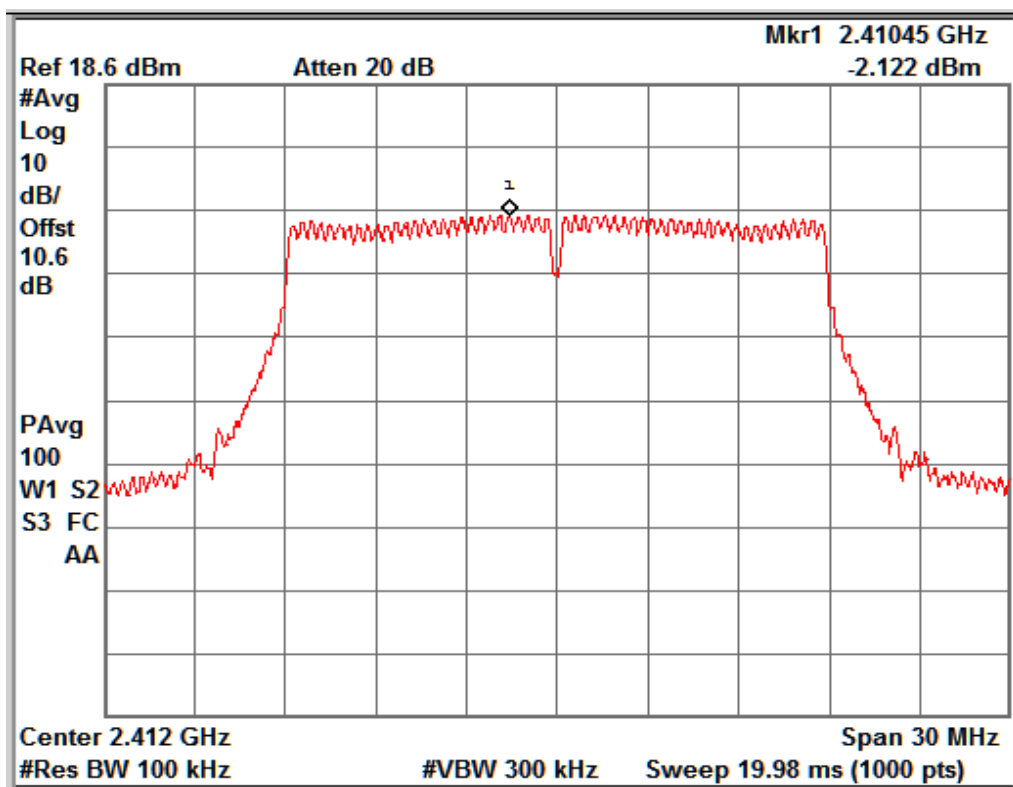


Data Rate: 54 Mbps

Channel Frequency: 2462 MHz

www.tuv.com
Result: n Mode

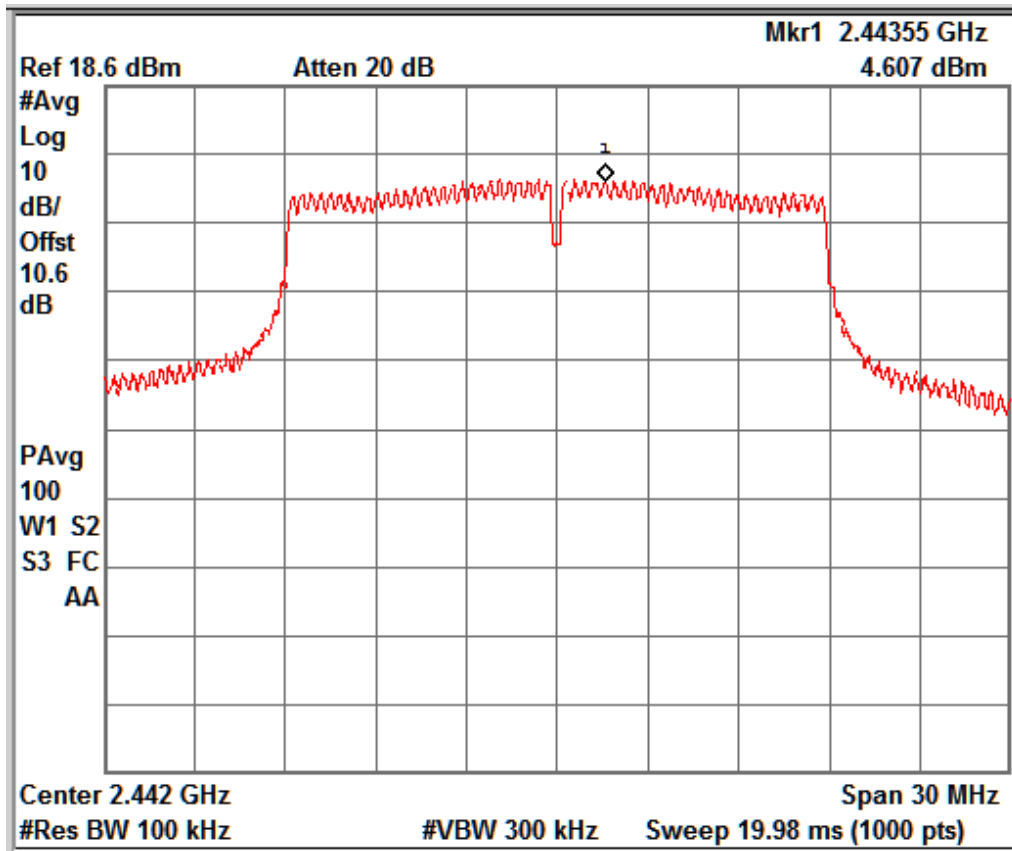
802.11 Protocol	Data Rate (Mbps)	Channel	Total PSD (dBm)	Limit (dBm)	Margin (dB)
n Mode	MCS 0	Low	-2.12	8	-10.12
		Mid	4.60	8	-3.40
		High	-2.67	8	-10.67
	MSC 4	Low	-1.37	8	-9.37
		Mid	4.61	8	-3.39
		High	-2.24	8	-10.24
	MCS 7	Low	-1.71	8	-9.71
		Mid	5.10	8	-2.90
		High	-2.06	8	-10.06



Data Rate: MSC 0

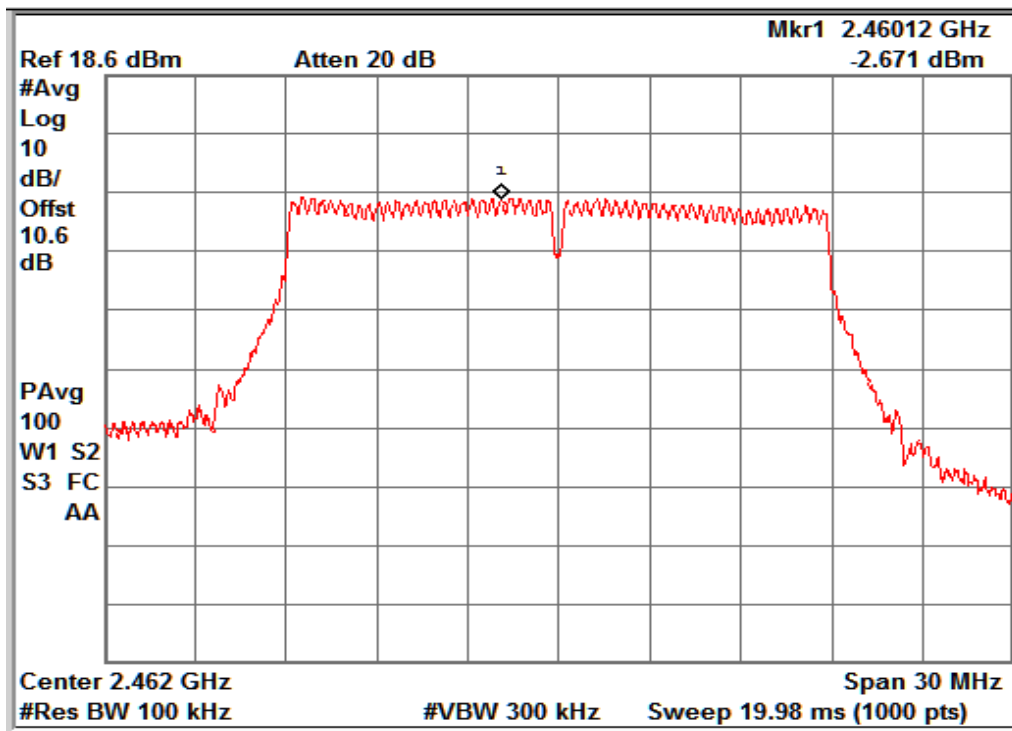
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: MSC 0

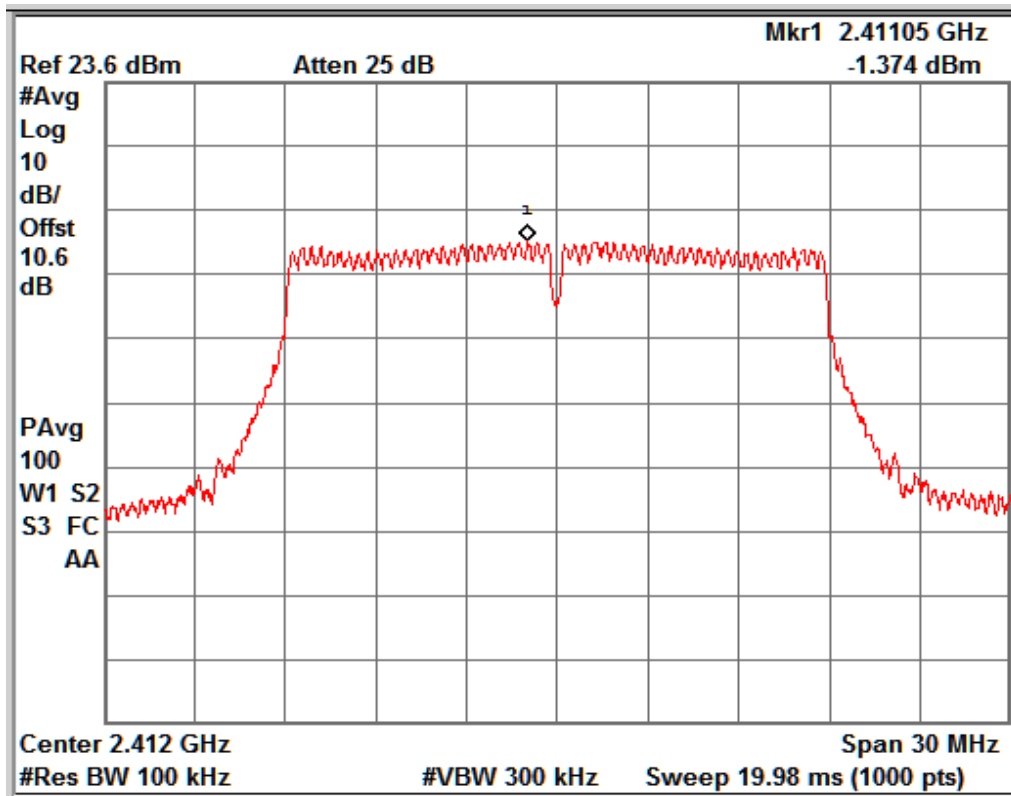
Channel Frequency: 2442 MHz



Data Rate: MSC 0

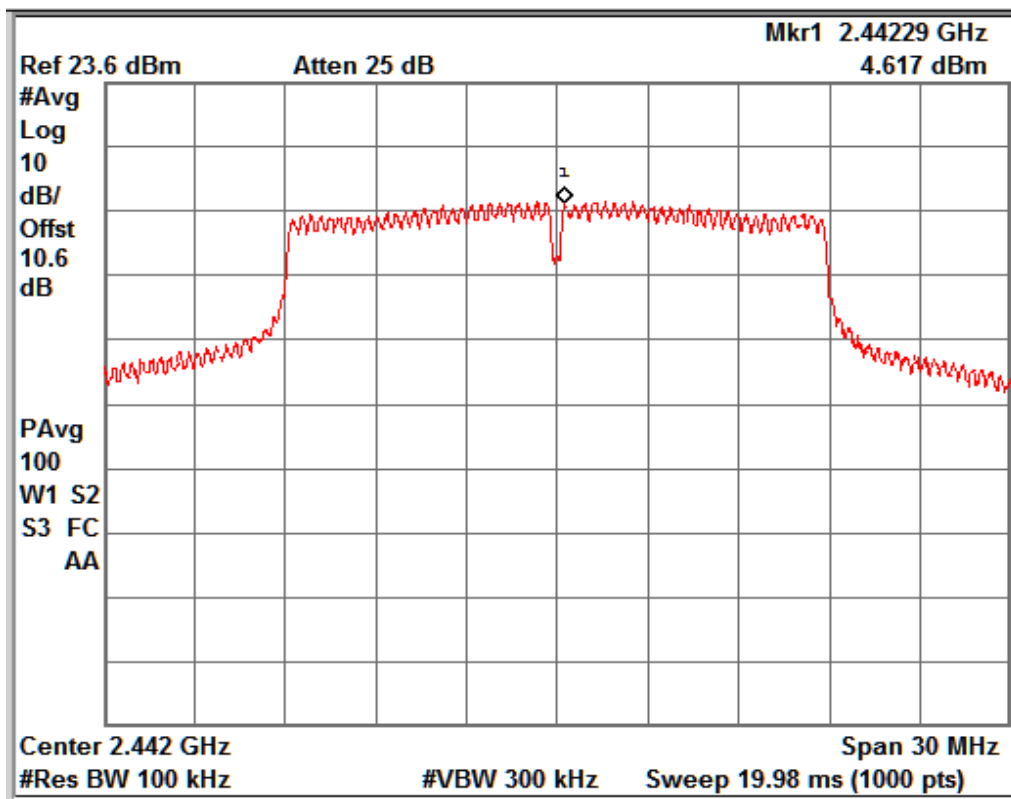
Channel Frequency: 2462 MHz

www.tuv.com



Data Rate: MSC 4

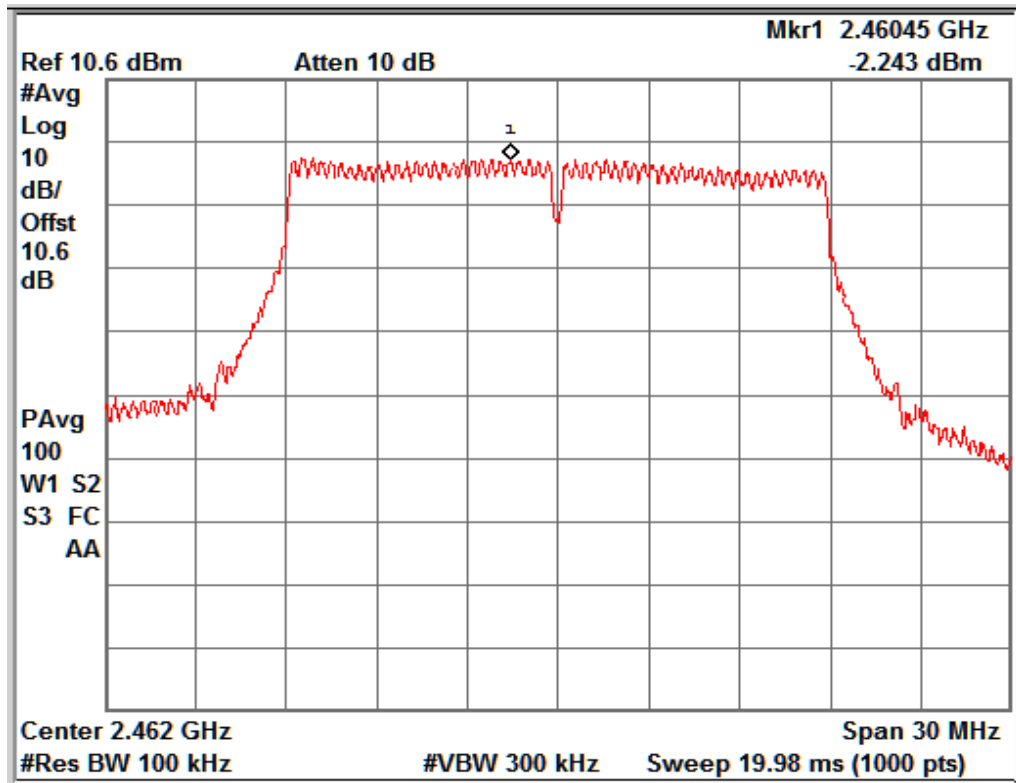
Channel Frequency: 2412 MHz



Data Rate: MSC 4

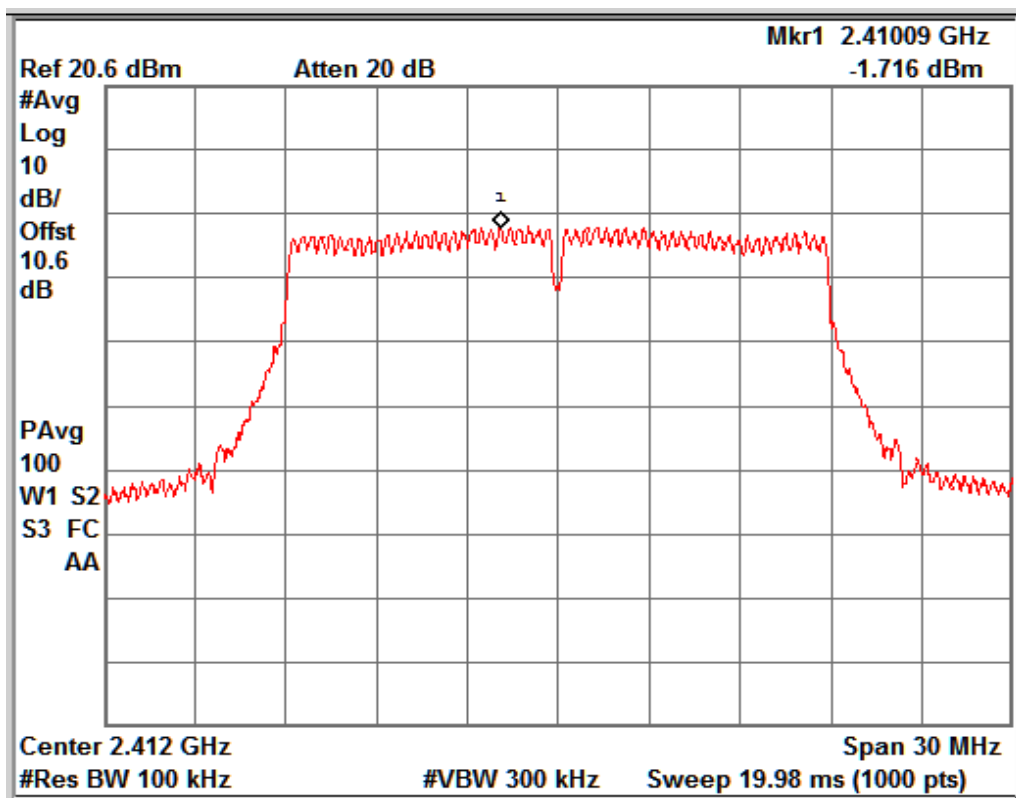
Channel Frequency: 2442 MHz

www.tuv.com



Data Rate: MSC 4

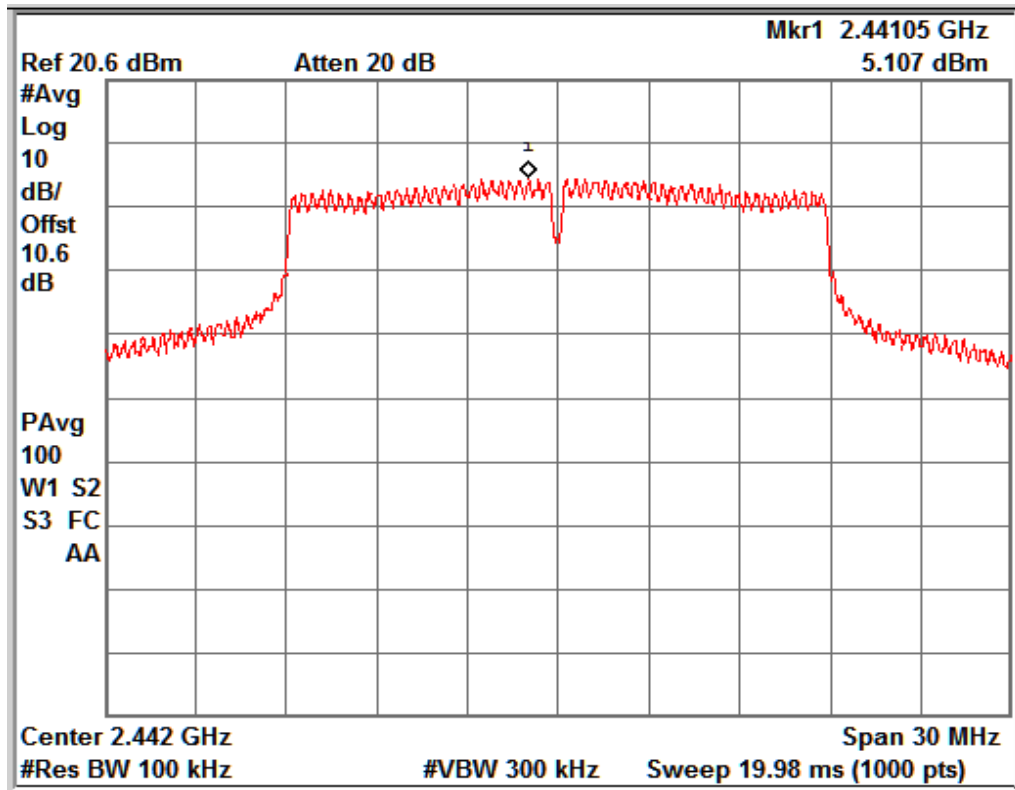
Channel Frequency: 2462 MHz



Data Rate: MSC 7

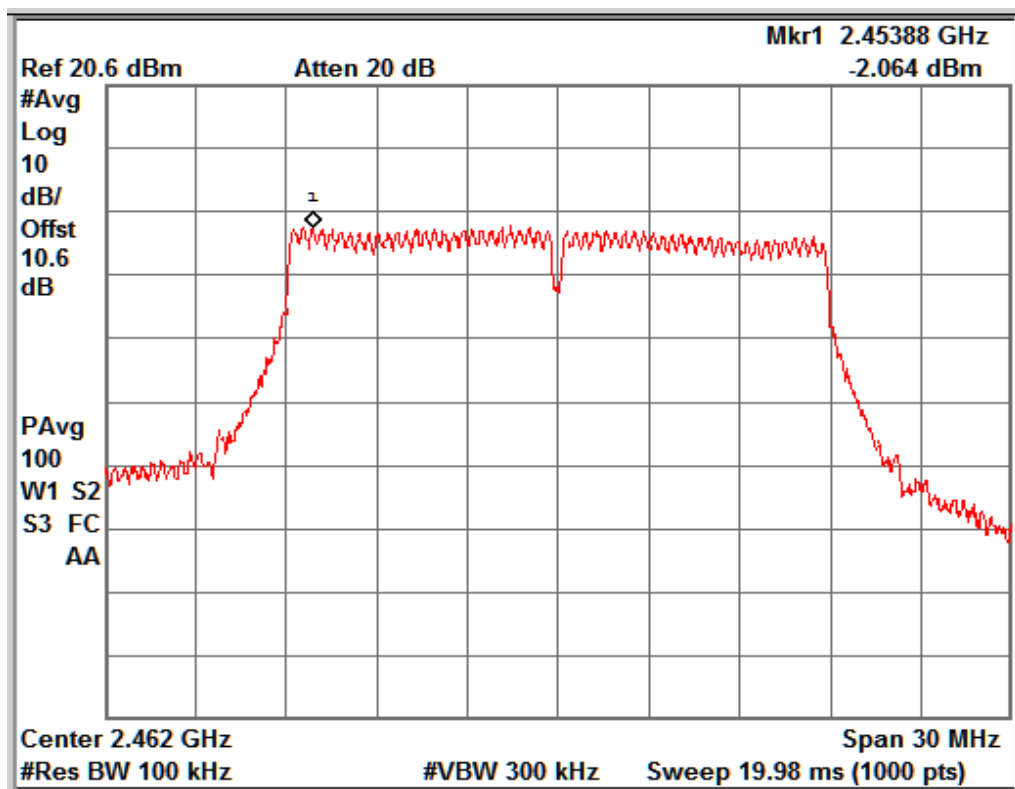
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: MSC 7

Channel Frequency: 2442 MHz



Data Rate: MSC 7

Channel Frequency: 2462 MHz

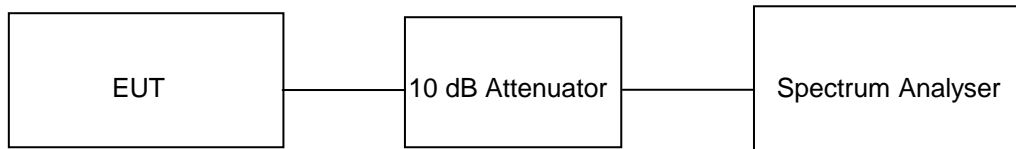
www.tuv.com
6 dB Bandwidth
Result

Section 15.247(a) (2)
Pass

Test Specification
Requirement

FCC Part 15 Section 15.247 (a) (2)
The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Method:

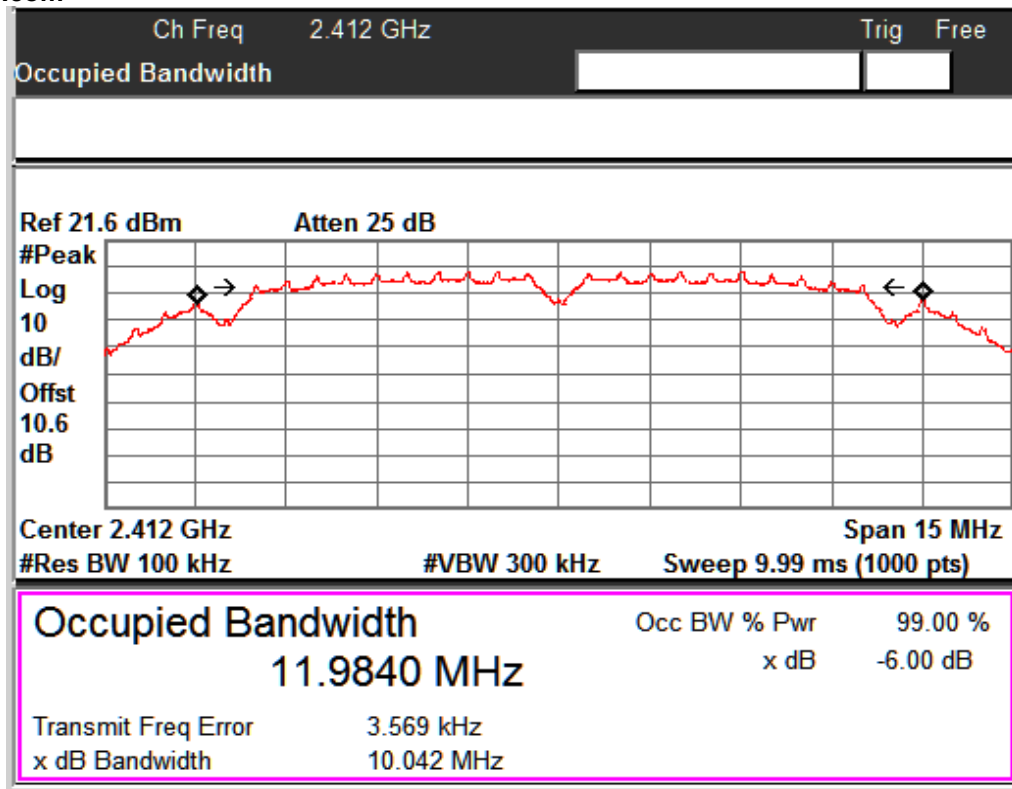


Test Result:

Cable Loss (0.6dB) + Attenuator (10dB): 10.6dB (Included in the test results)

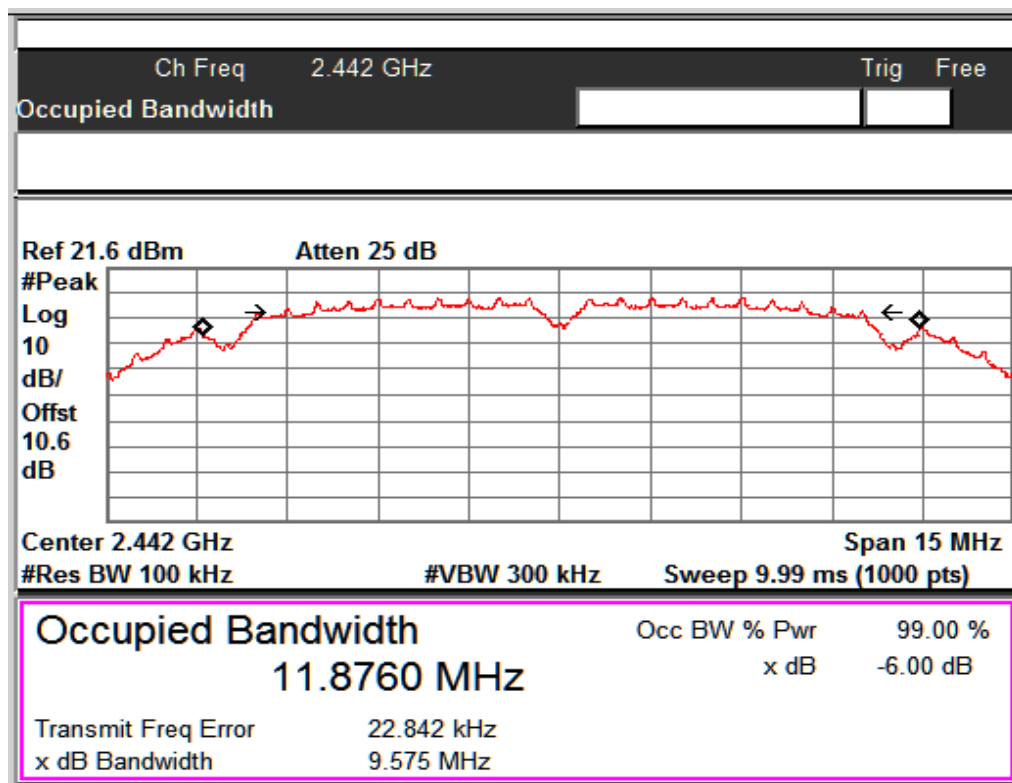
802.11 Protocol	Data Rate (Mbps)	Channel	6 dB Bandwidth (MHz)	99% OBW (MHz)
b Mode	1	Low	10.04	11.98
		Mid	9.57	11.87
		High	9.57	11.97
	11	Low	9.52	11.75
		Mid	9.50	11.71
		High	9.55	11.93

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Data Rate: 1 Mbps

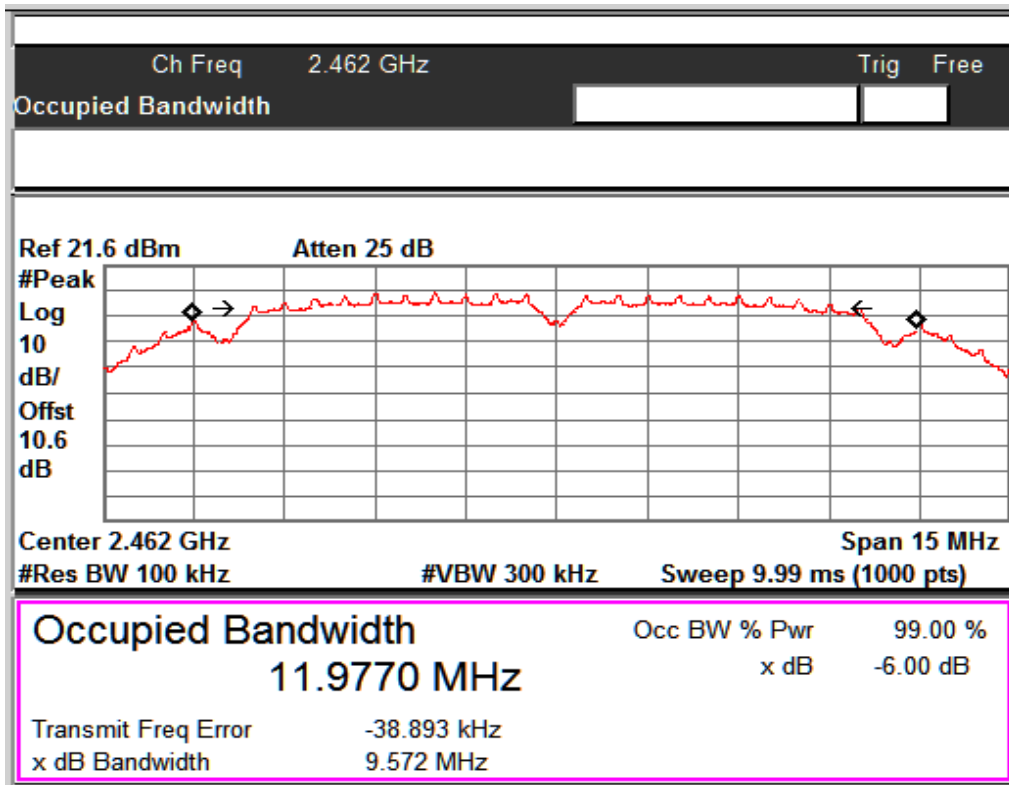
Channel Frequency: 2412 MHz



Data Rate: 1 Mbps

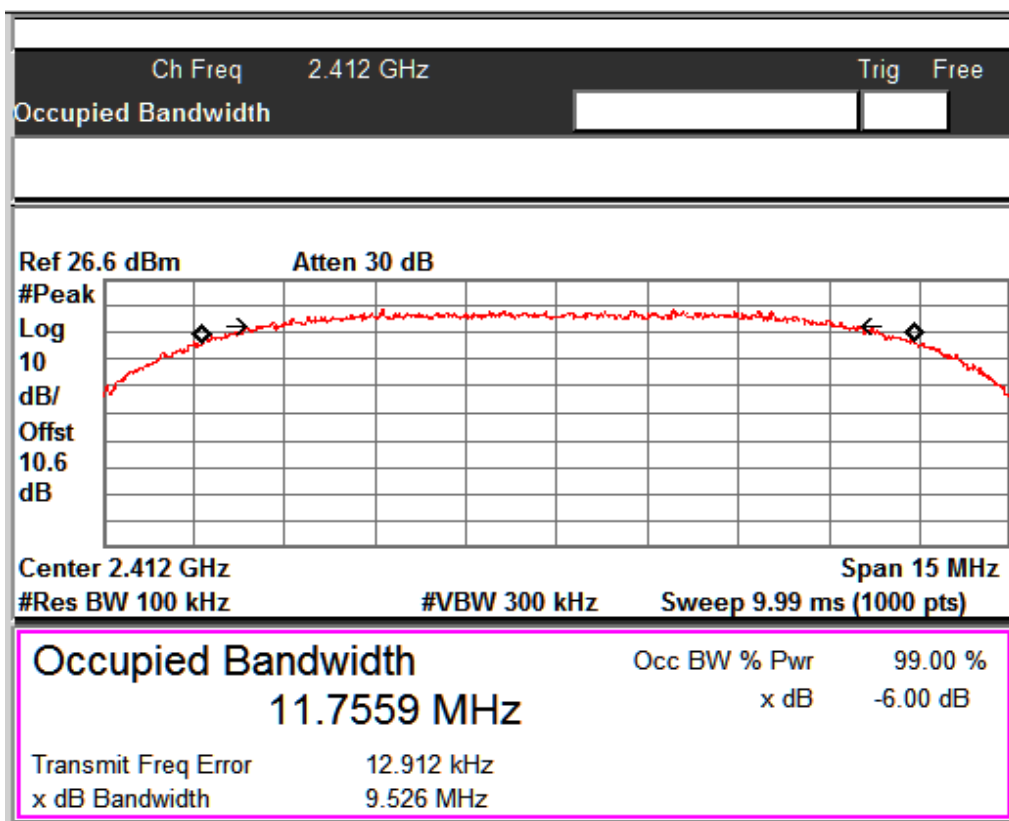
Channel Frequency: 2442 MHz

www.tuv.com



Data Rate: 1 Mbps

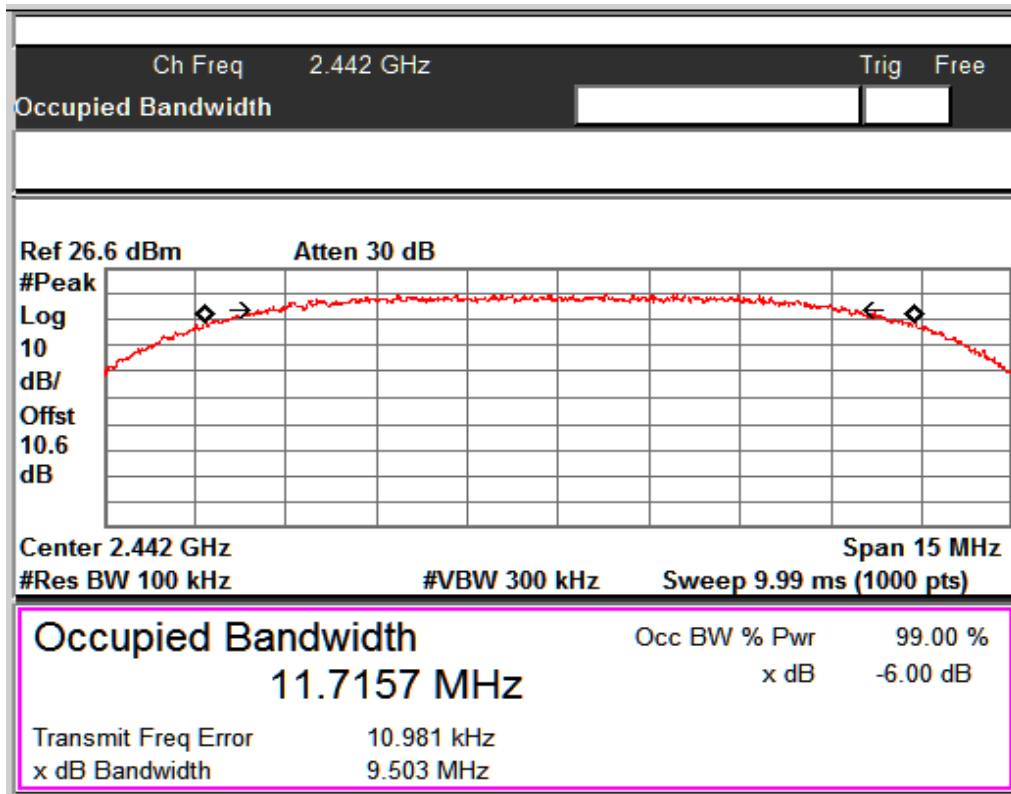
Channel Frequency: 2462 MHz



Data Rate: 11 Mbps

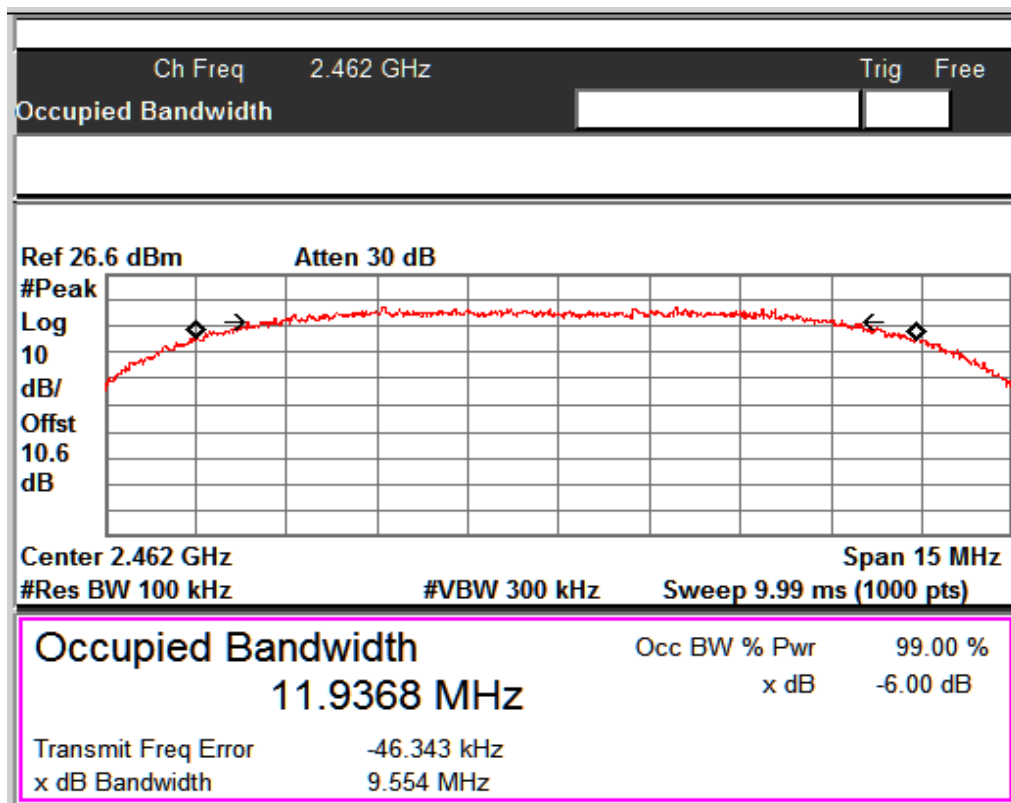
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: 11 Mbps

Channel Frequency: 2442 MHz

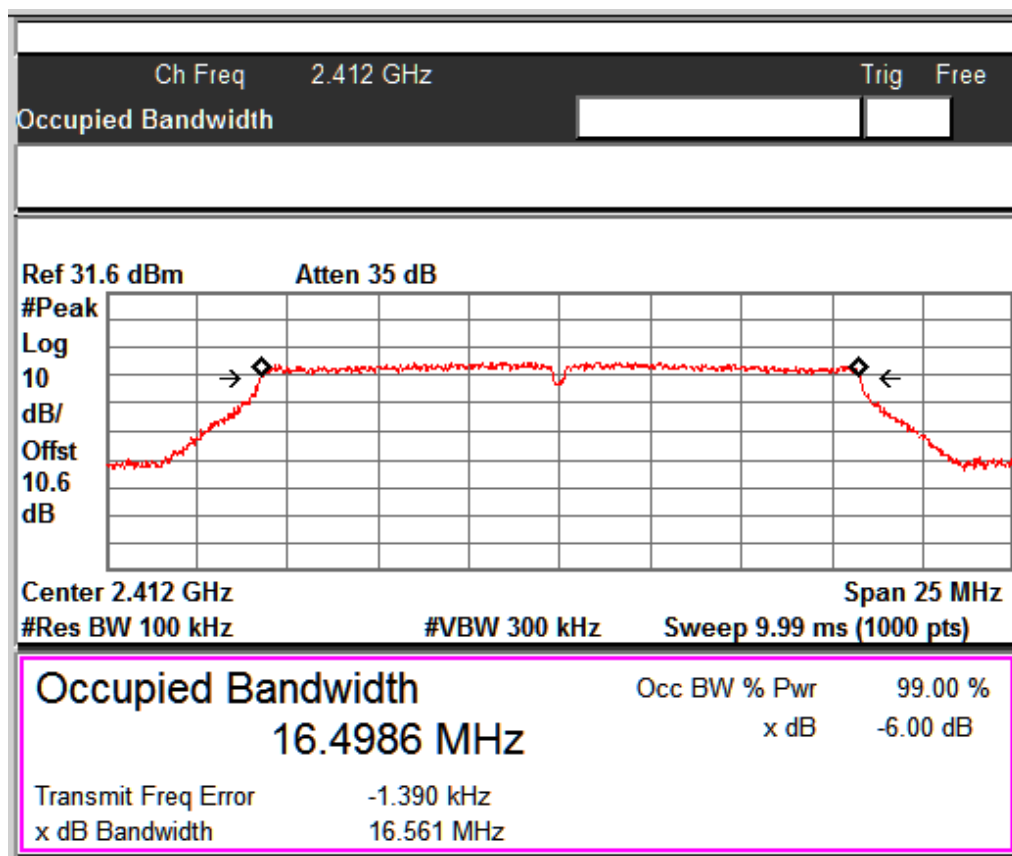


Data Rate: 11 Mbps

Channel Frequency: 2462 MHz

www.tuv.com
Result: g Mode

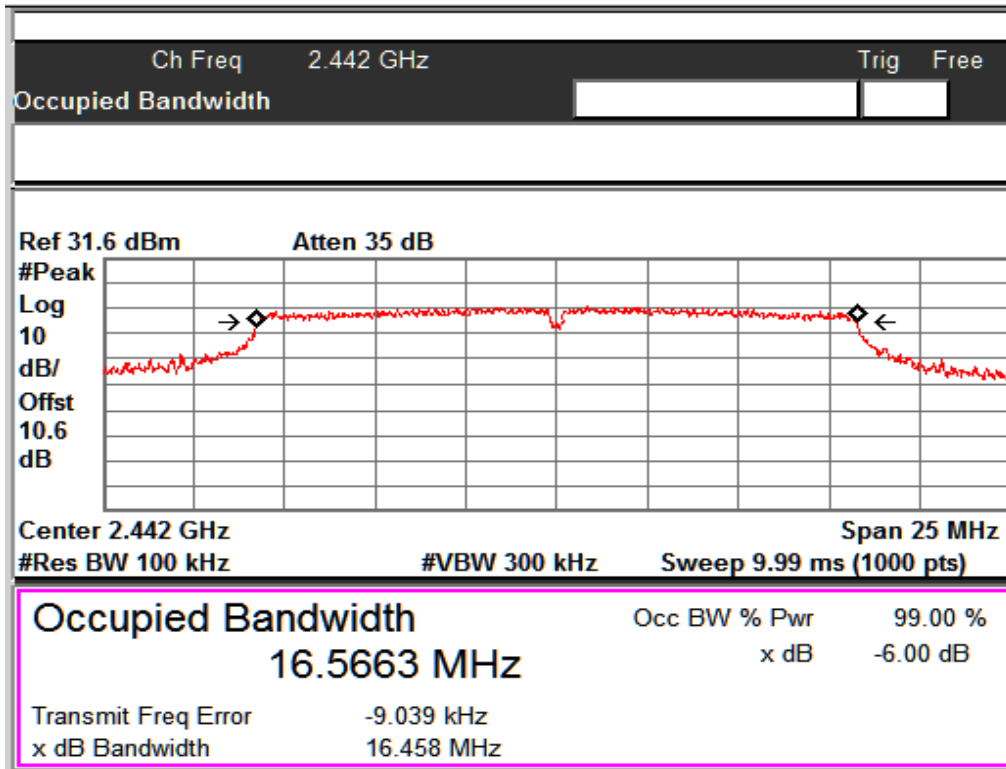
802.11 Protocol	Data Rate (Mbps)	Channel	6 dB Bandwidth (MHz)	99% OBW (MHz)
g Mode	6	Low	16.56	16.49
		Mid	16.45	16.56
		High	16.55	16.51
	24	Low	16.53	16.45
		Mid	16.49	16.45
		High	16.53	16.45
	54	Low	16.53	16.45
		Mid	16.44	16.45
		High	16.54	16.47



Data Rate: 6 Mbps

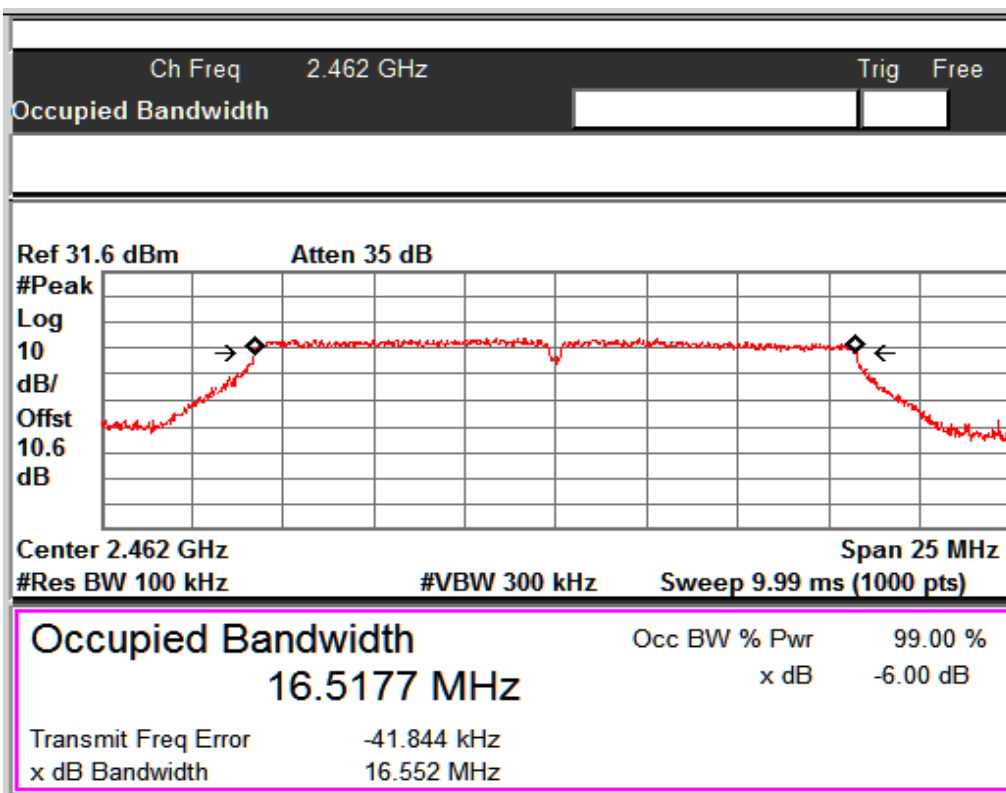
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: 6 Mbps

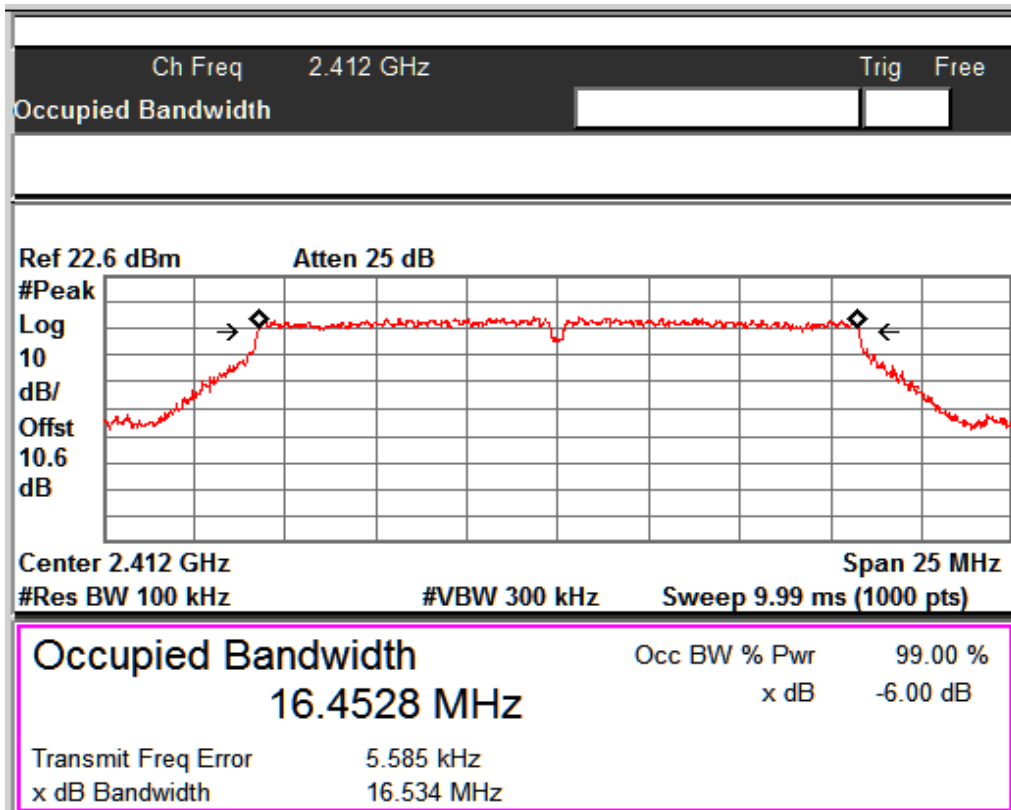
Channel Frequency: 2442 MHz



Data Rate: 6 Mbps

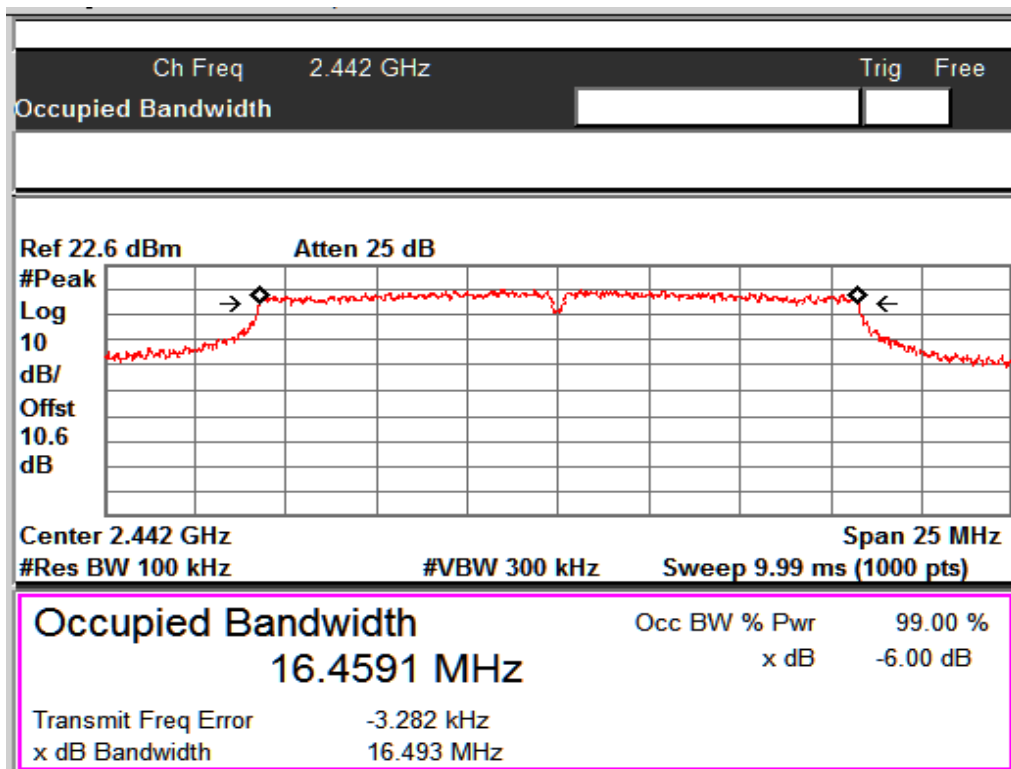
Channel Frequency: 2462 MHz

www.tuv.com



Data Rate: 24 Mbps

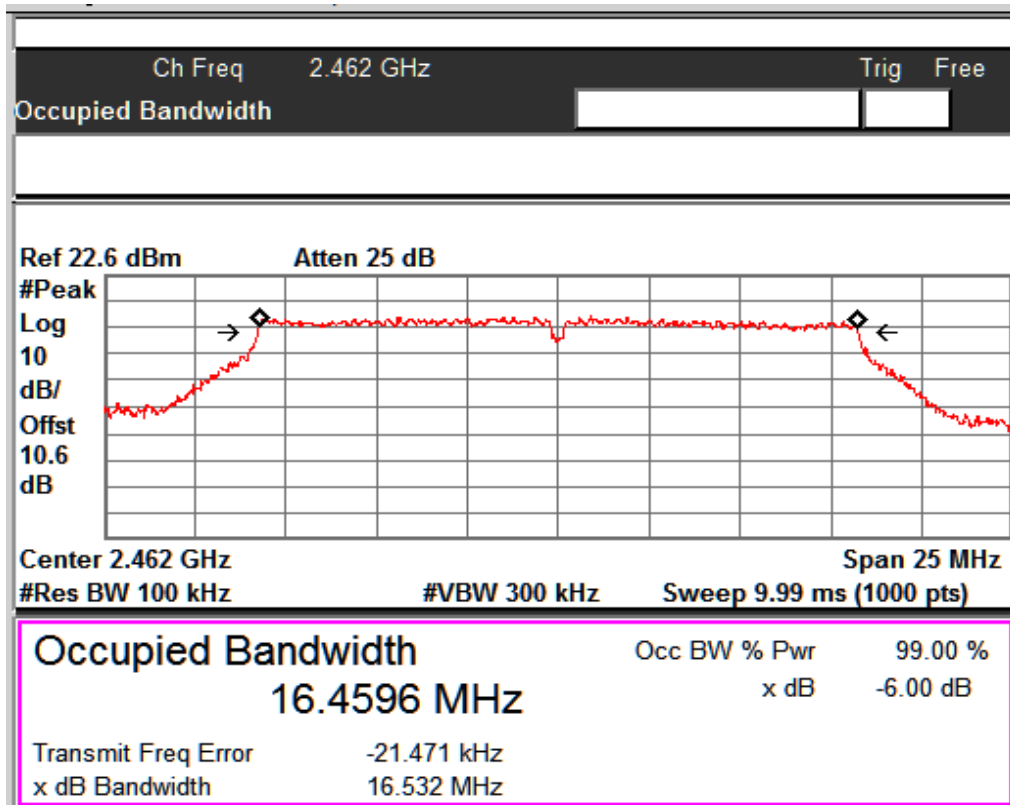
Channel Frequency: 2412 MHz



Data Rate: 24 Mbps

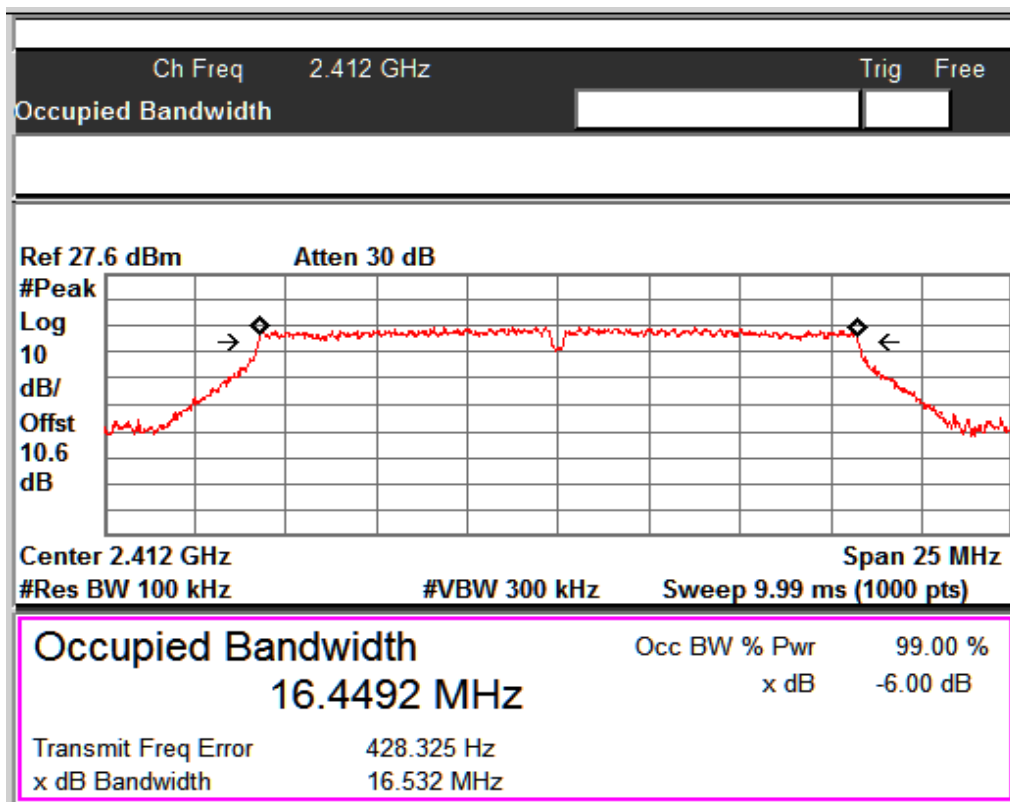
Channel Frequency: 2442 MHz

www.tuv.com



Data Rate: 24 Mbps

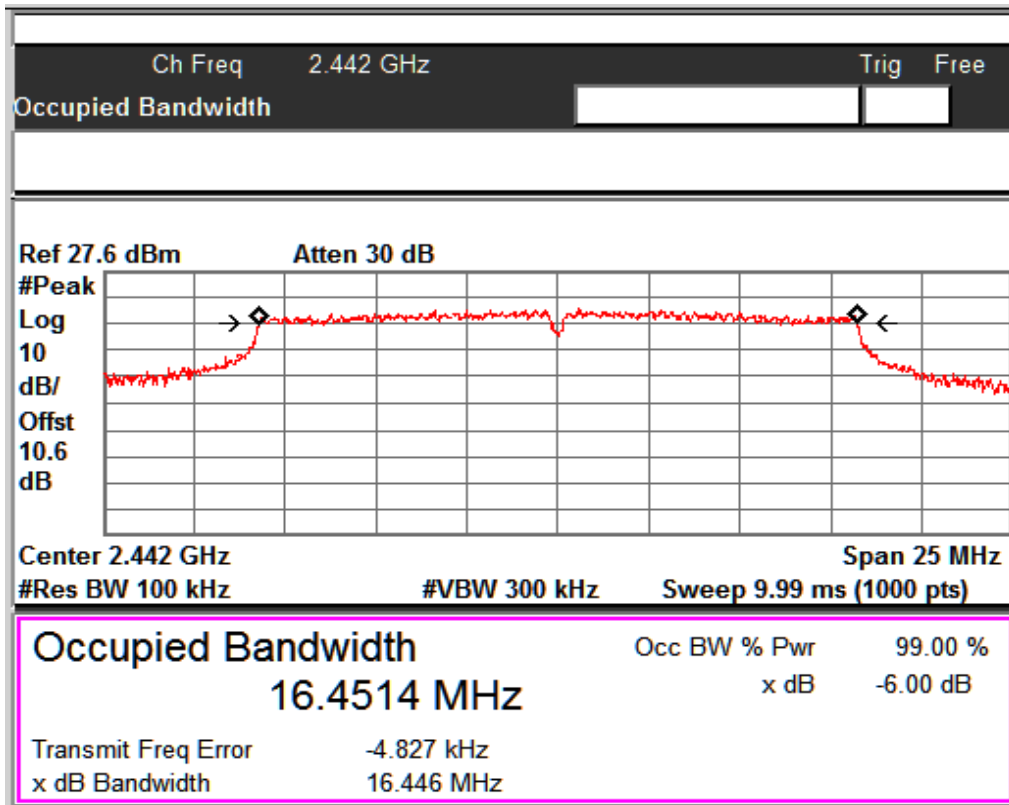
Channel Frequency: 2462 MHz



Data Rate: 54 Mbps

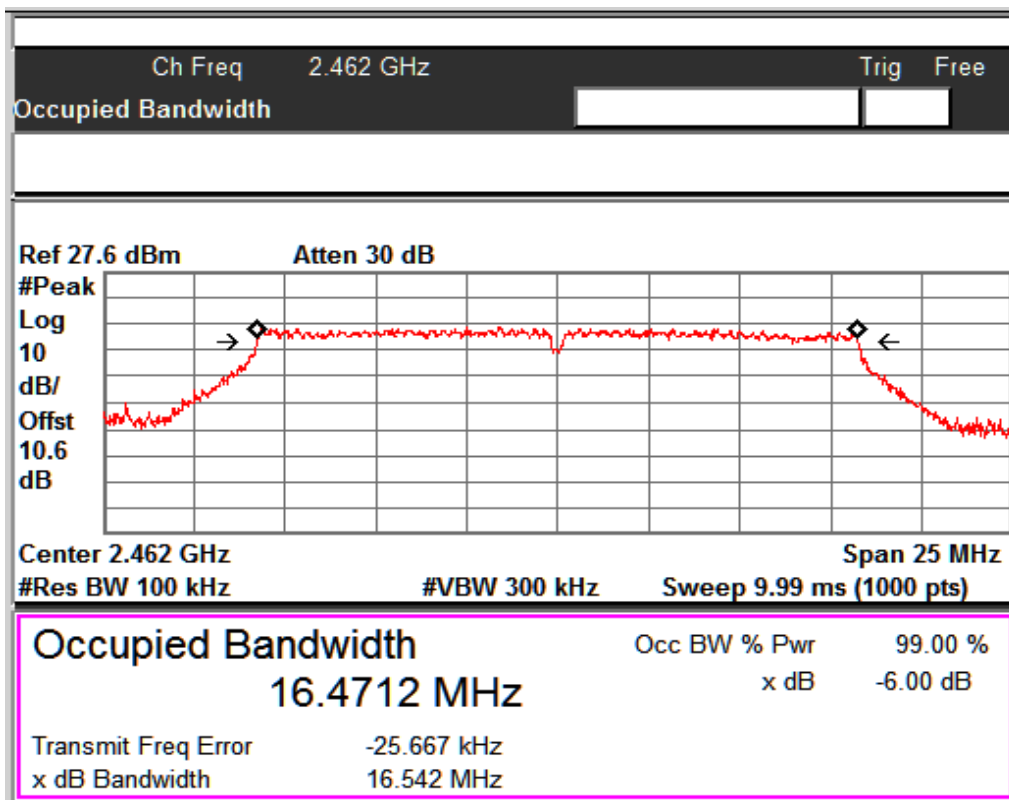
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: 54 Mbps

Channel Frequency: 2442 MHz

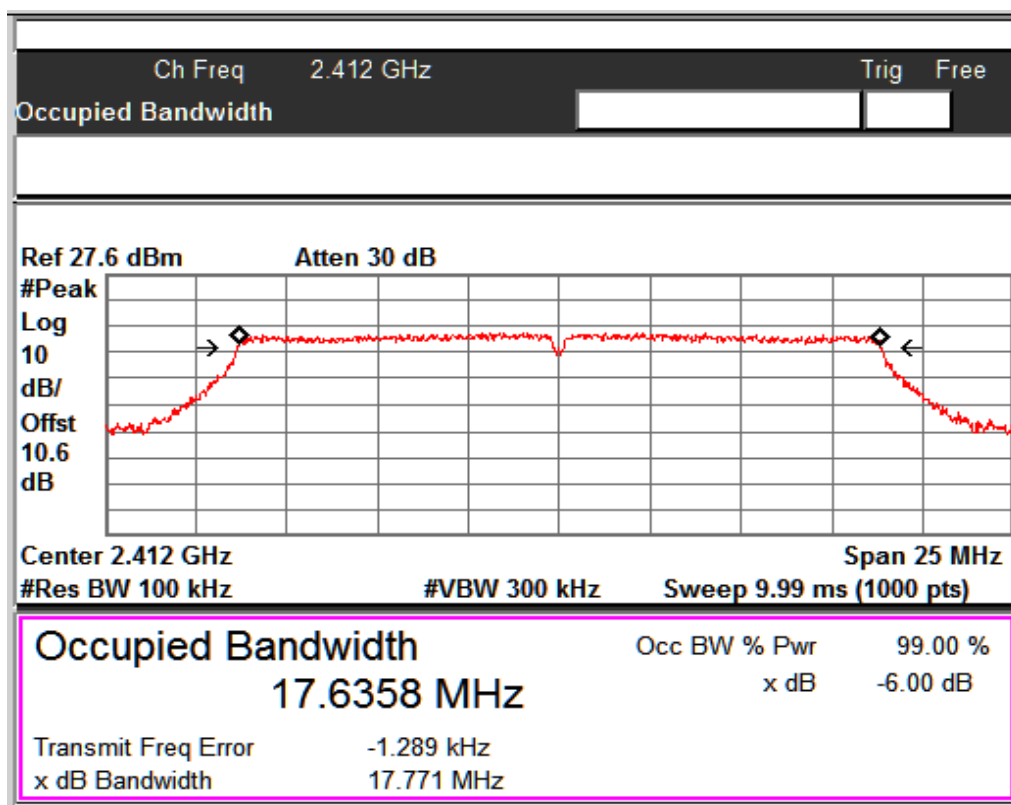


Data Rate: 54 Mbps

Channel Frequency: 2462 MHz

www.tuv.com
Result: n Mode

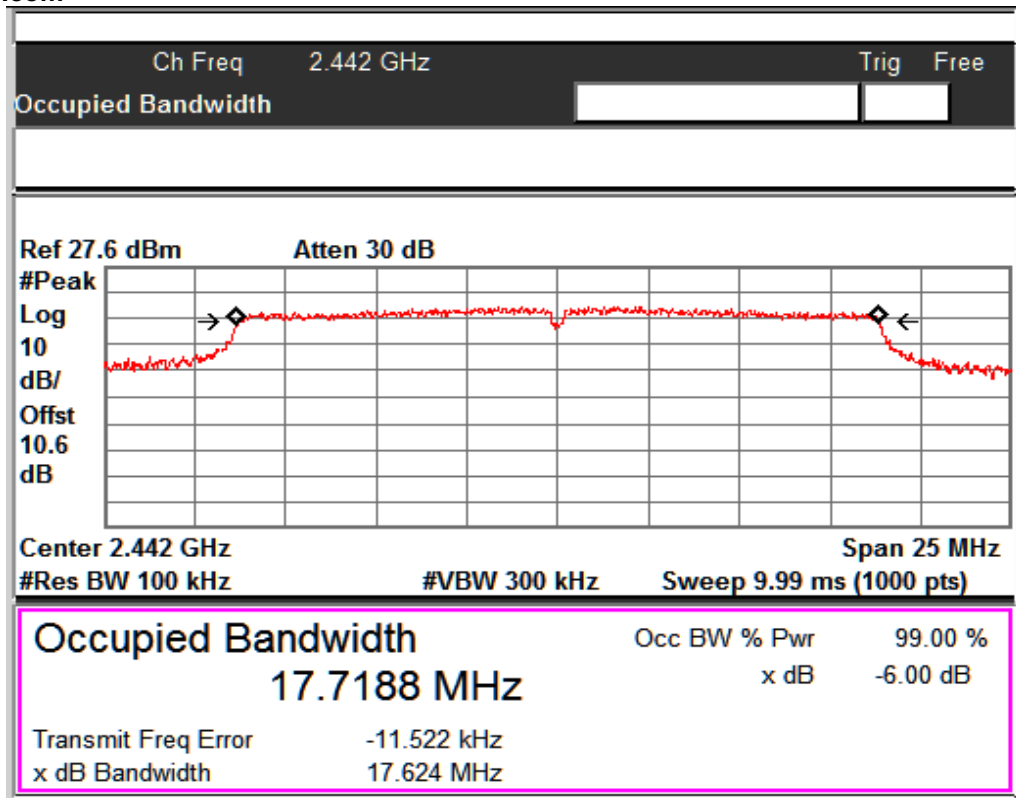
802.11 Protocol	Data Rate (Mbps)	Channel	6 dB Bandwidth (MHz)	99% OBW (MHz)
n Mode	MCS 0	Low	17.77	17.63
		Mid	17.62	17.71
		High	17.75	17.65
	MCS 4	Low	17.76	17.62
		Mid	17.7	17.7
		High	17.78	17.63
	MCS 7	Low	17.75	17.64
		Mid	17.7	17.69
		High	17.76	17.62



Data Rate: MCS 0

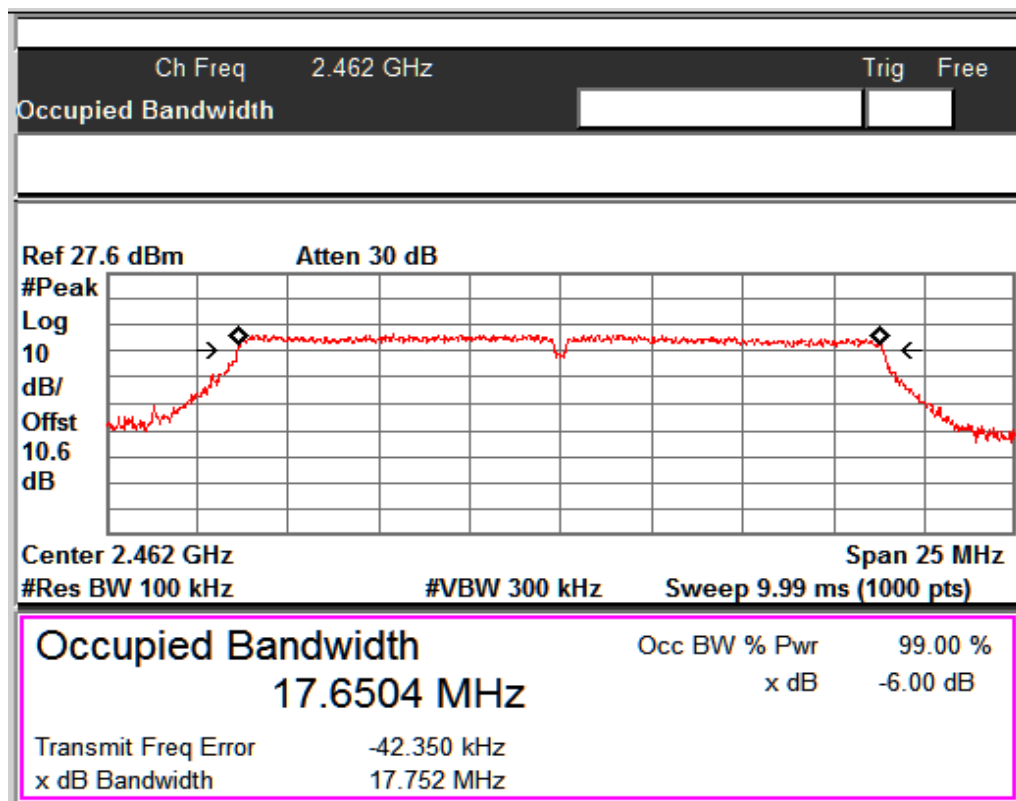
Channel Frequency: 2412 MHz

www.tuv.com



Data Rate: MCS 0

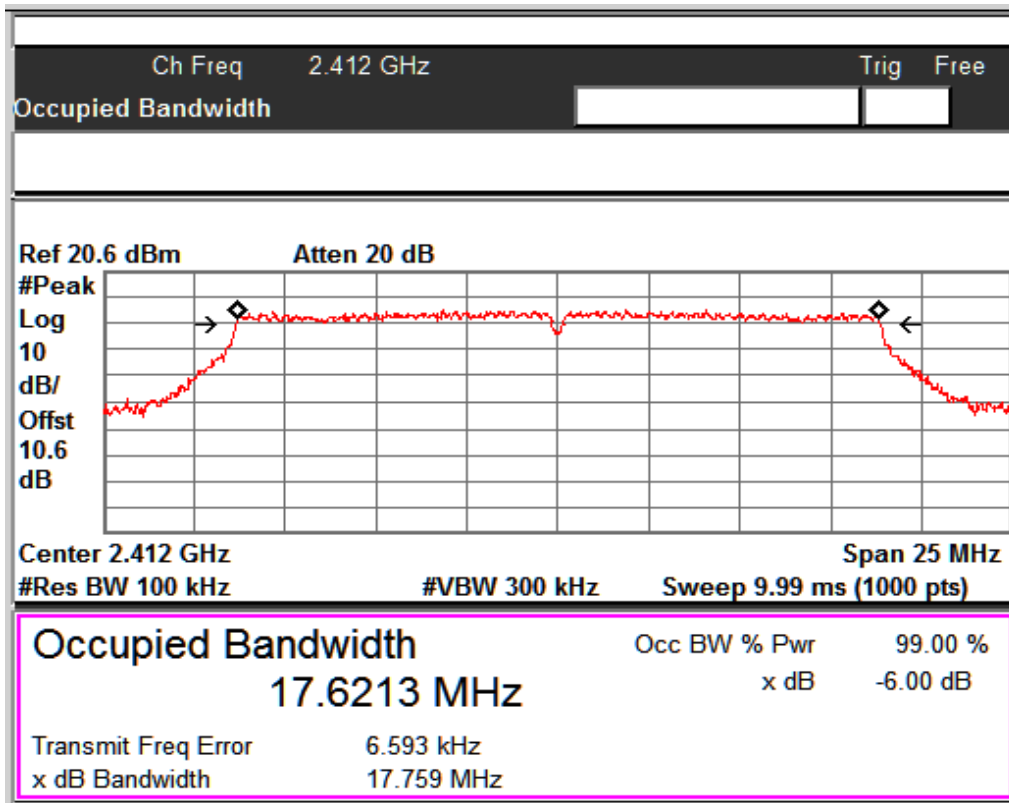
Channel Frequency: 2442 MHz



Data Rate: MCS 0

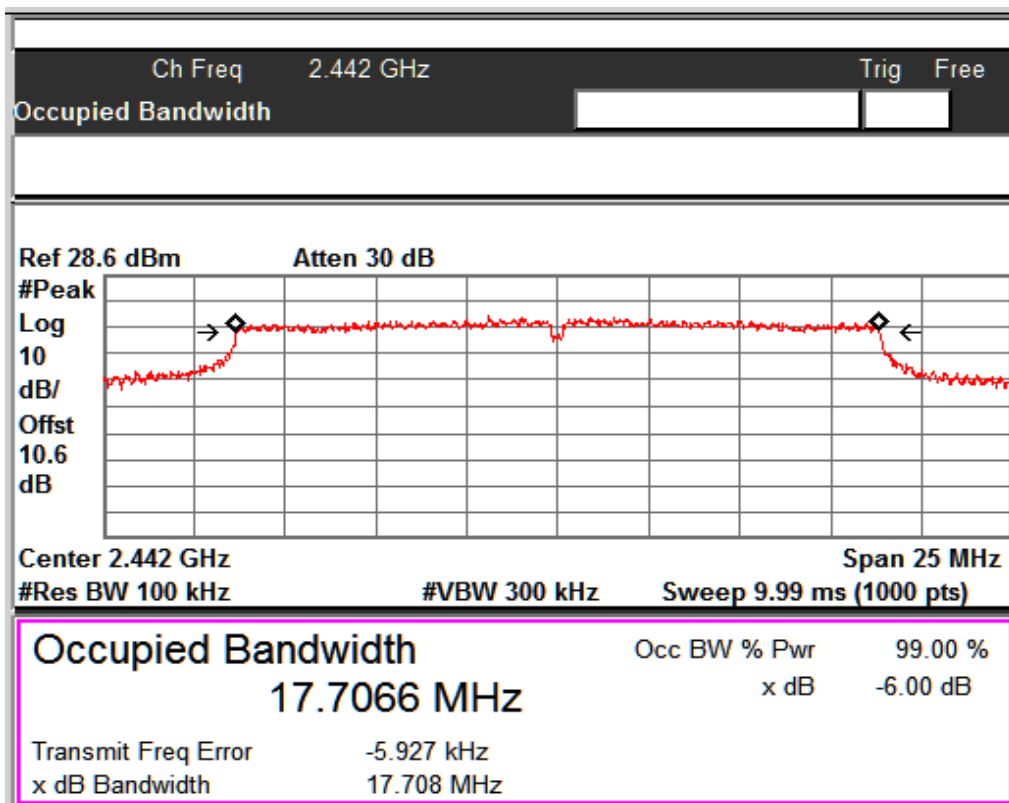
Channel Frequency: 2462

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Data Rate: MCS 4

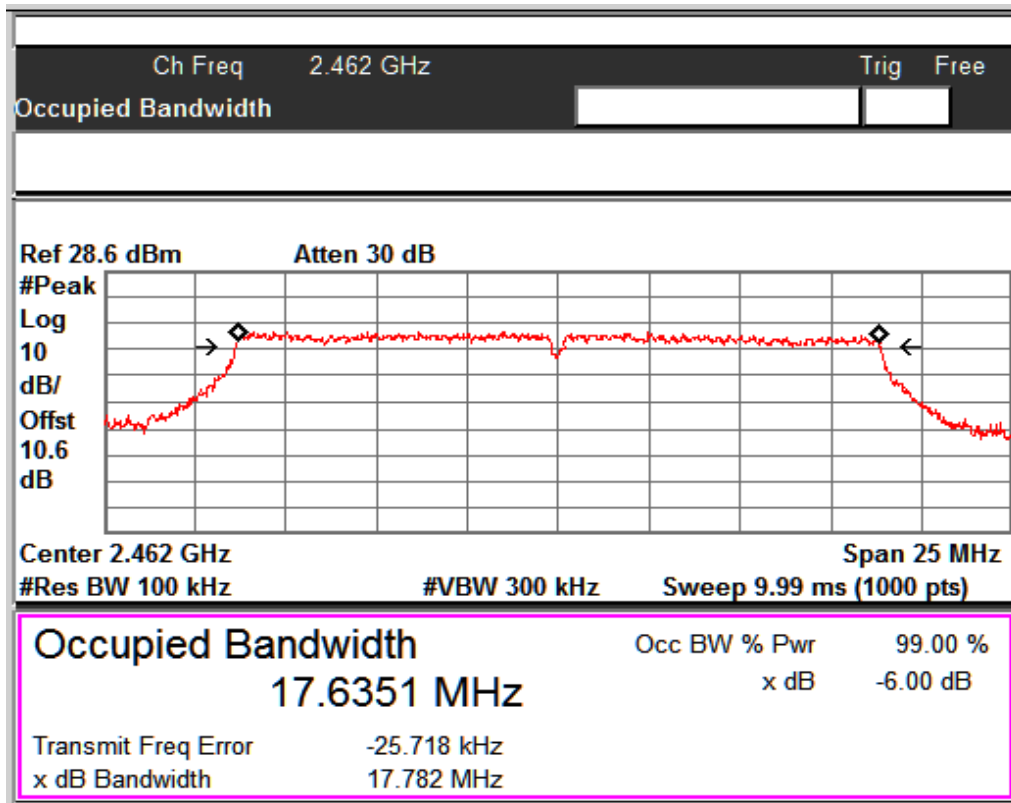
Channel Frequency: 2412



Data Rate: MCS 4

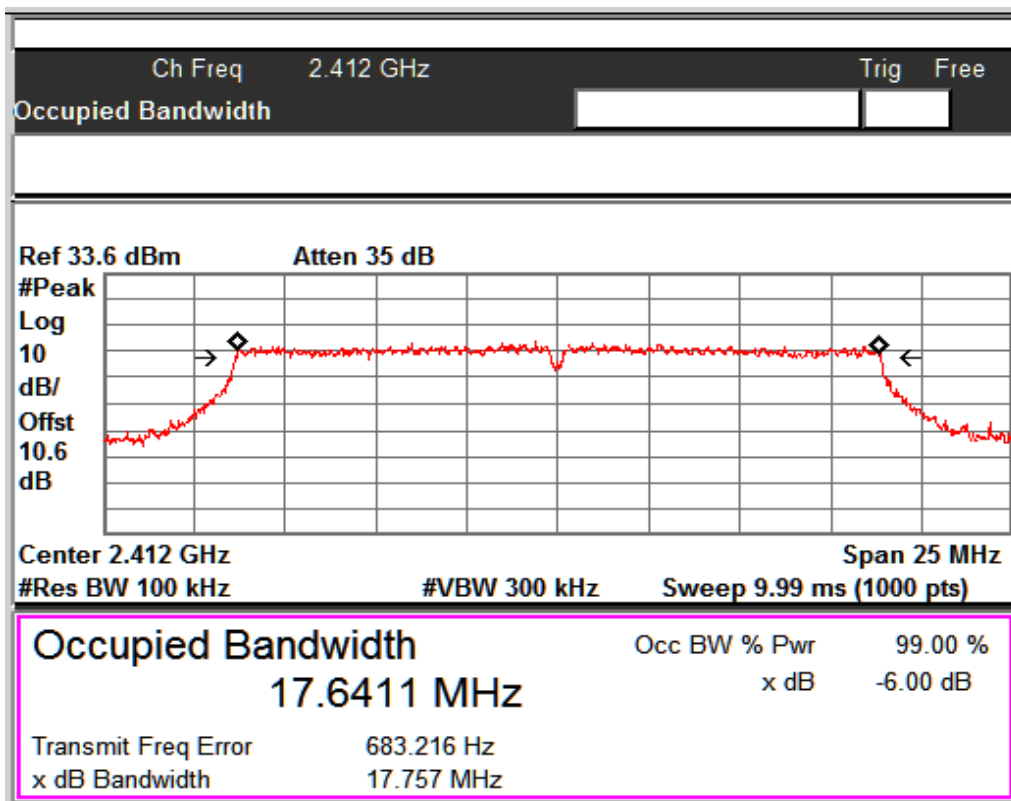
Channel Frequency: 2442

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Data Rate: MCS 4

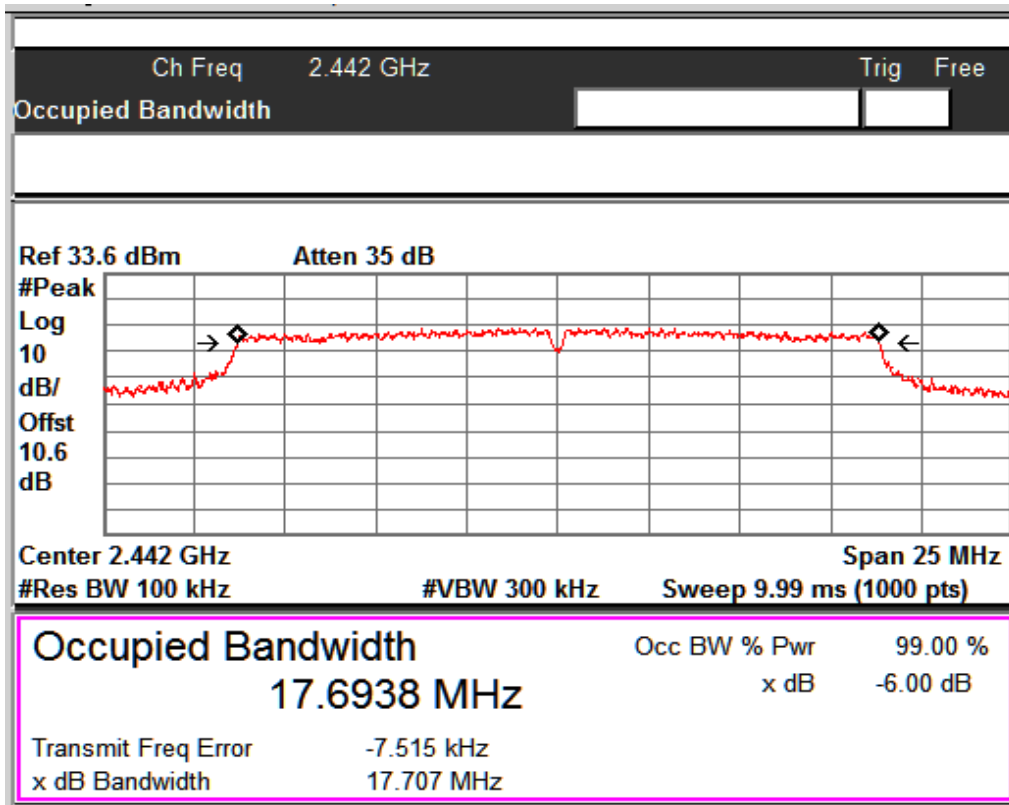
Channel Frequency: 2462



Data Rate: MCS 7

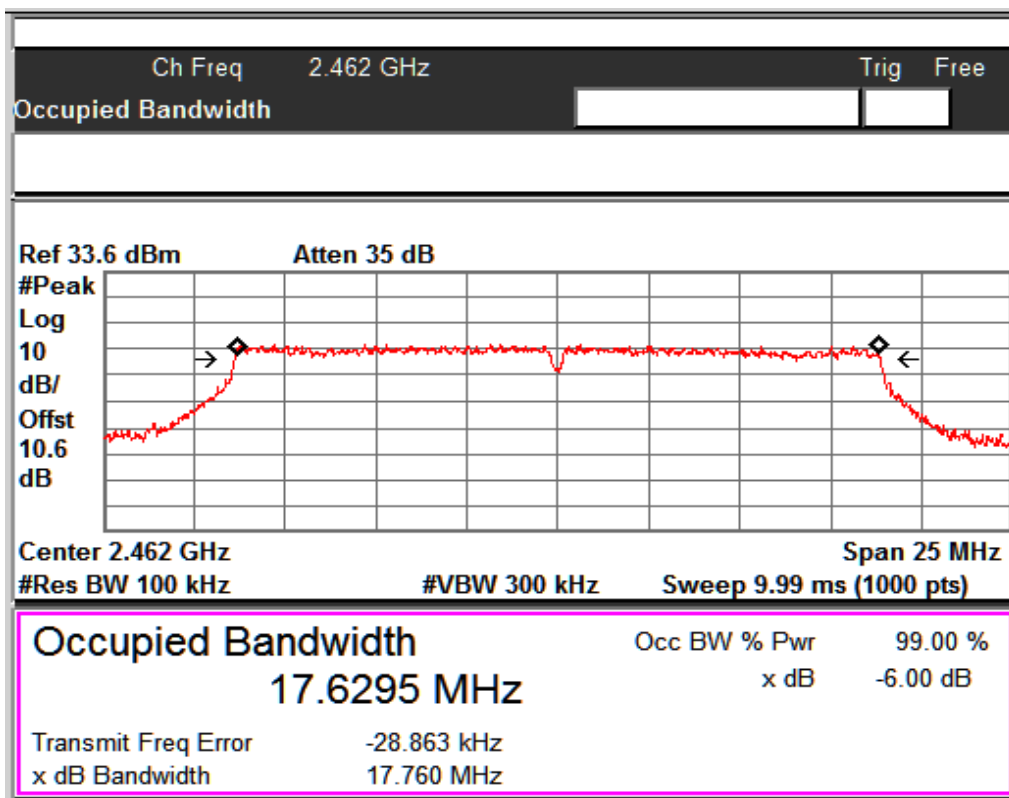
Channel Frequency: 2412

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Data Rate: MCS 7

Channel Frequency: 2442



Data Rate: MCS 7

Channel Frequency: 2462

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**Emissions in restricted frequency bands
Result**

**Section 15.247(d)
Pass**

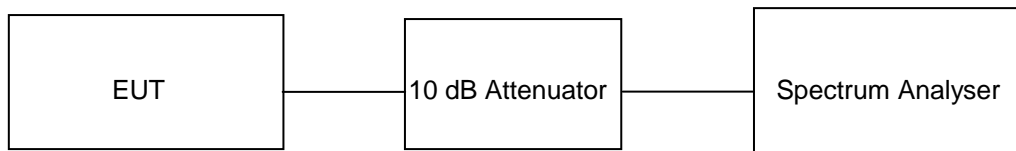
Test Specification
Detector Function
Requirement

FCC Part 15 Section 15.247(d)

Peak

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Method:



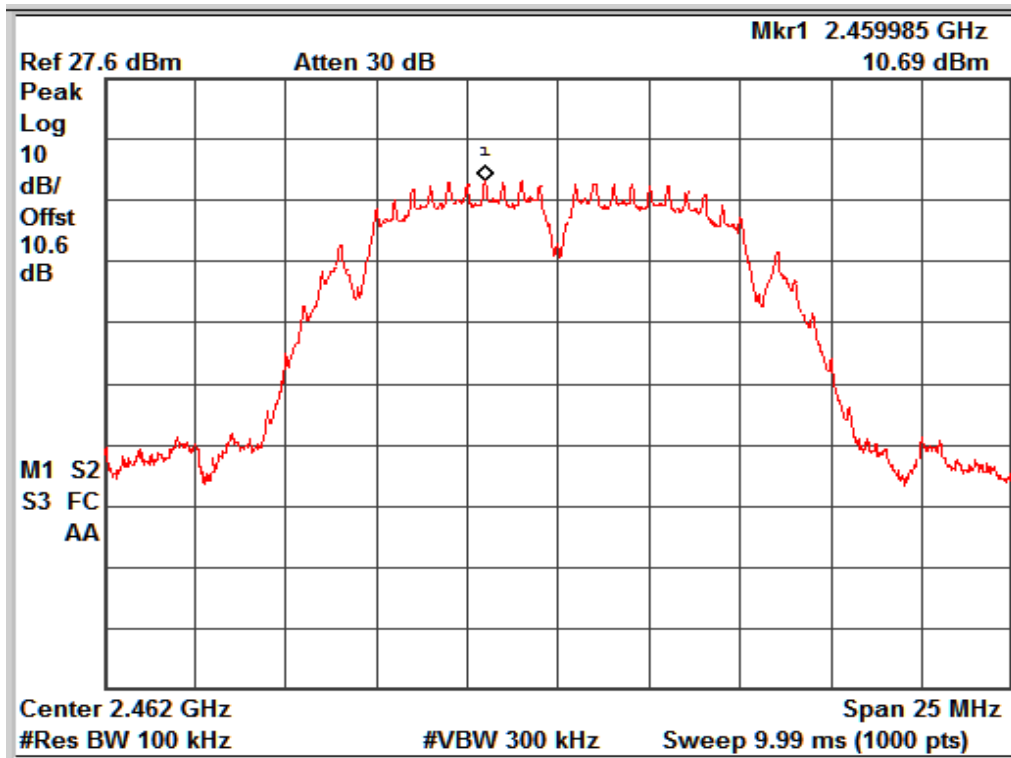
Test Result:

Cable Loss (0.6dB) + Attenuator (10dB): 10.6dB (Included in the test results)

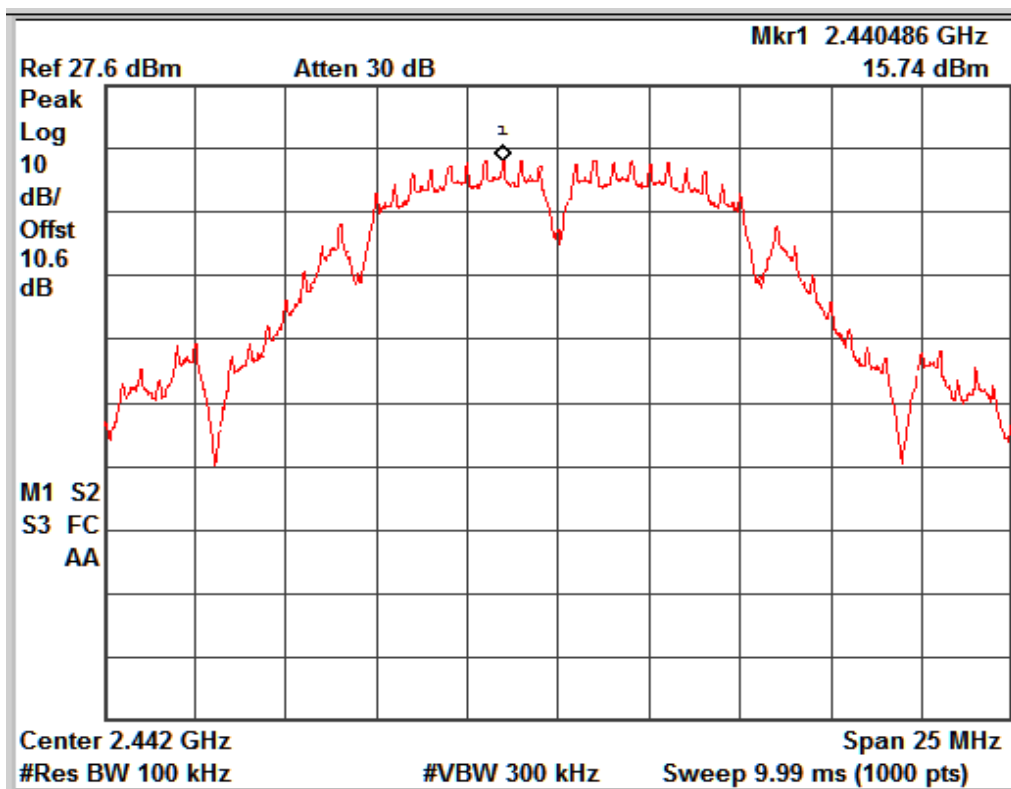
802.11 Protocol	Data Rate (Mbps)	Channel	Value at Band Edge		Reference Value B (dBm)	Band Edge Value A-B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
b Mode	1	Low	2398.05	-32.65	10.69	-43.34	-30
		High	2835.00	-40.78	10.69	-51.47	-30
	11	Low	2400.00	-25.83	15.74	-41.57	-30
		High	2483.50	-39.22	15.74	-54.96	-30

Note: The channel no. 11 (2462 MHz) in 1 Mbps & Channel no. 7 (2442 MHz) in 11 Mbps found to contain the maximum PSD level and is used to establish the reference level.

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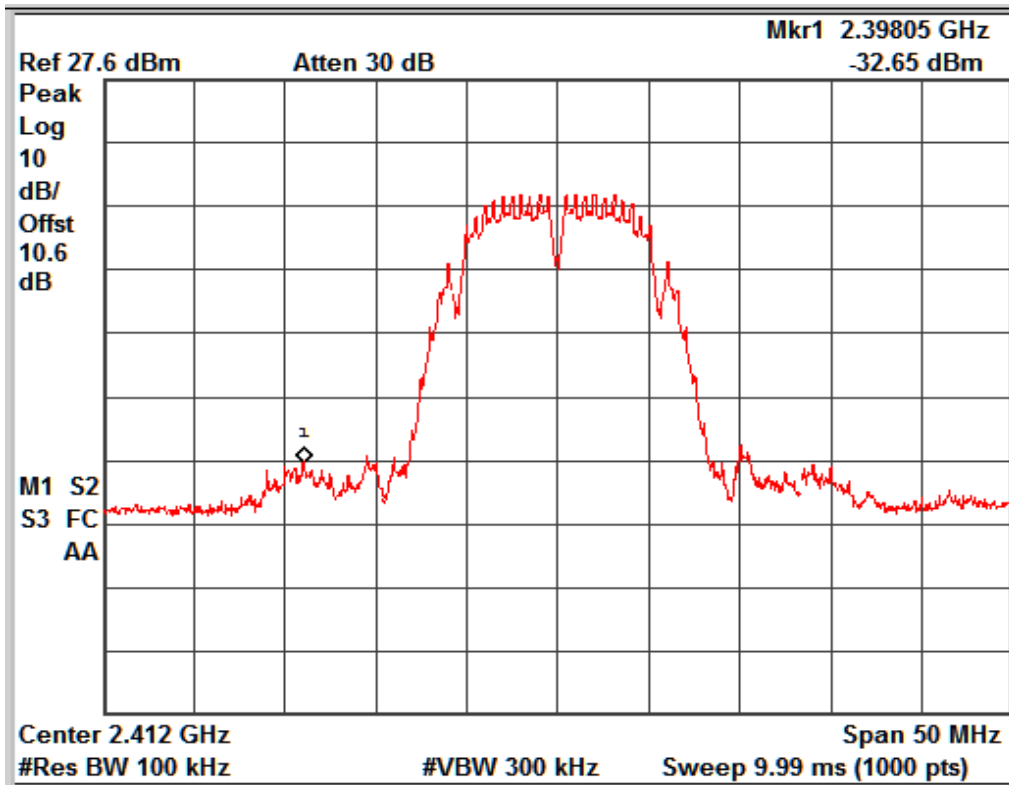


Reference Level Plot: 1 Mbps



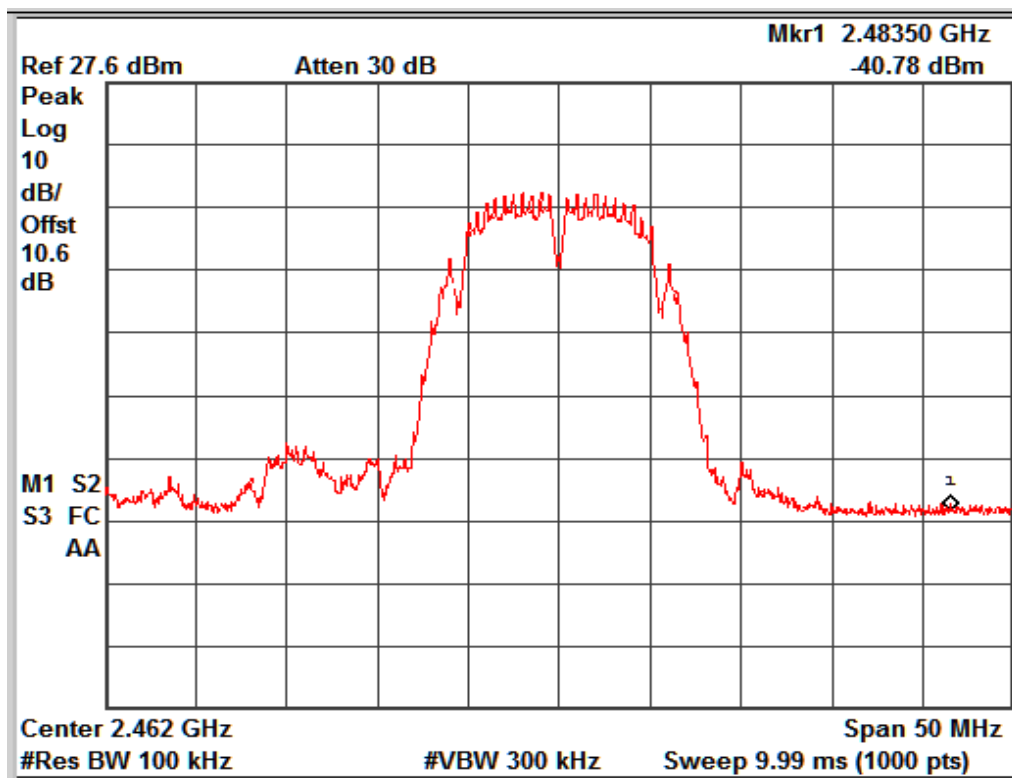
Reference Level Plot: 11 Mbps

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Data Rate: 1 Mbps

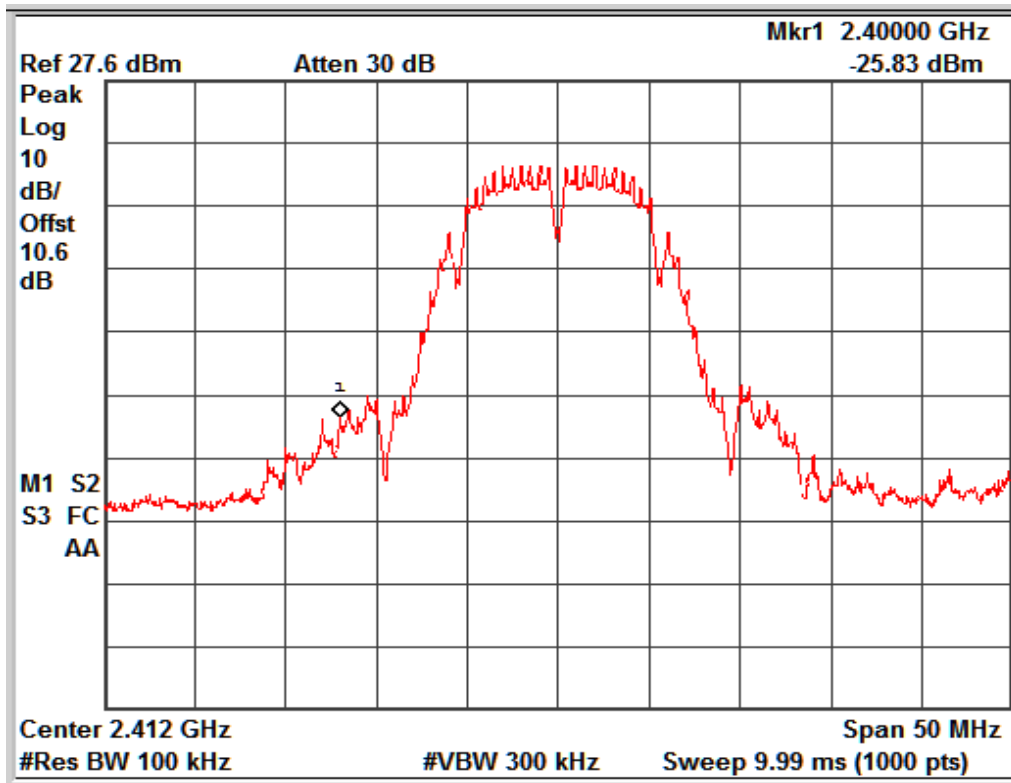
Channel Frequency: 2412



Data Rate: 1 Mbps

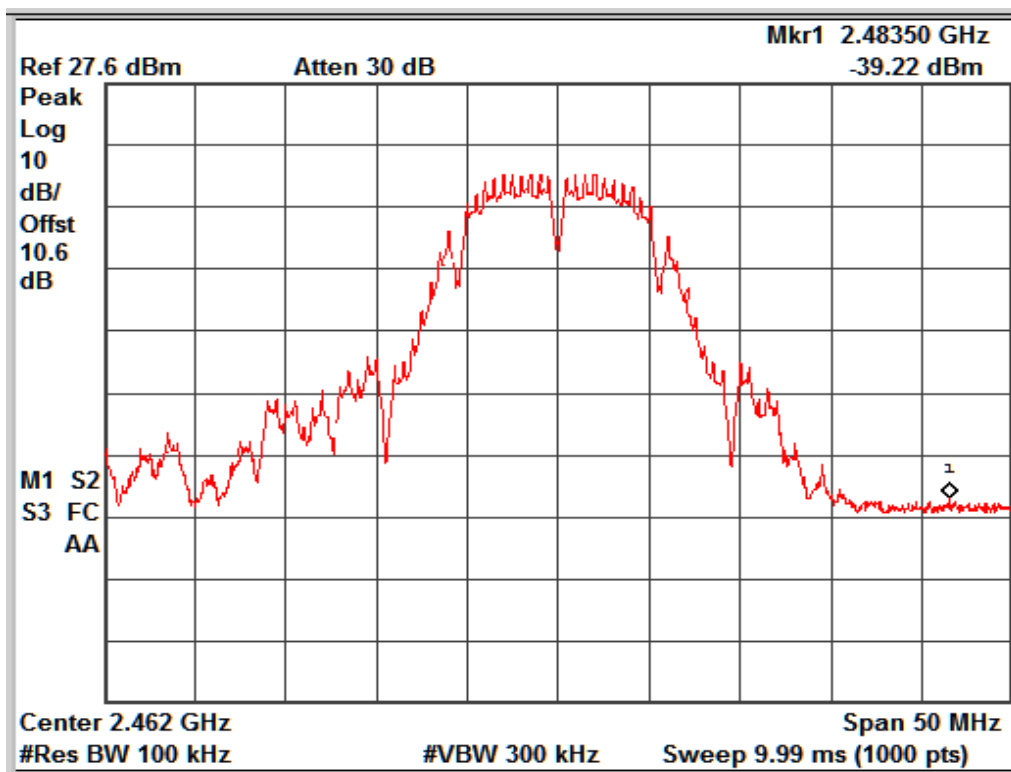
Channel Frequency: 2462

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Data Rate: 11 Mbps

Channel Frequency: 2412



Data Rate: 11 Mbps

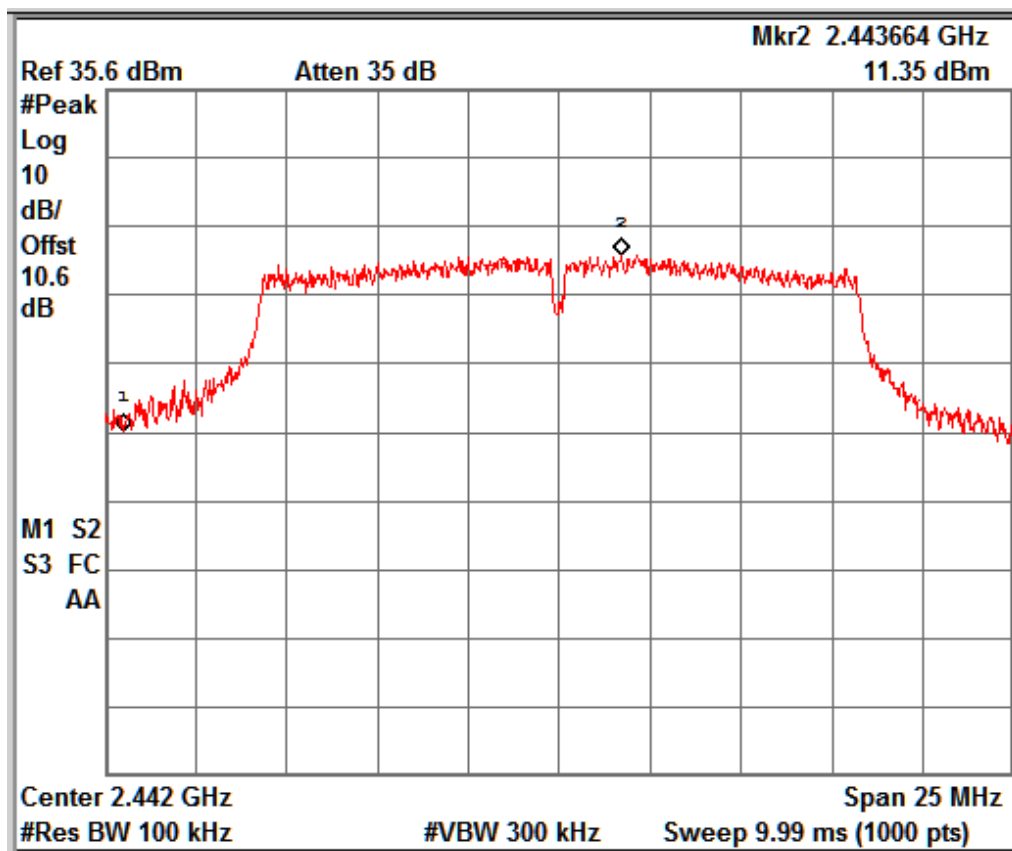
Channel Frequency: 2462

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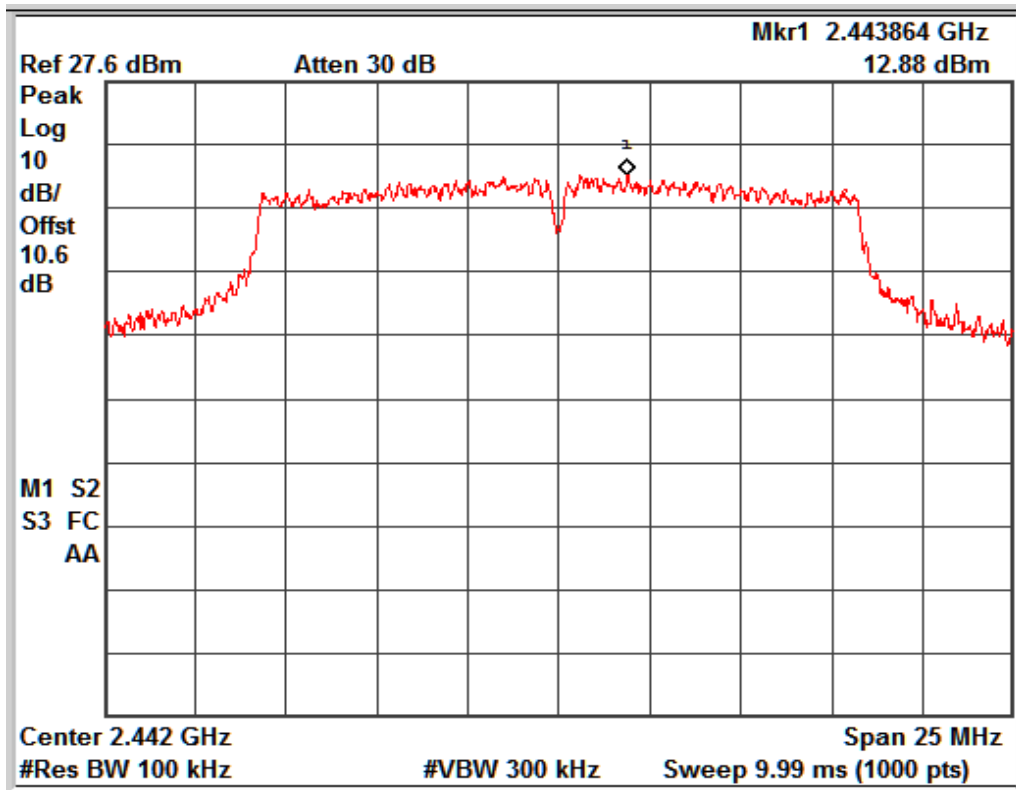
Result: g Mode

802.11 Protocol	Data Rate (Mbps)	Channel	Value at Band Edge		Reference Value B (dBm)	Band Edge Value A-B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
g Mode	6	Low	2396	-35.15	11.35	-46.5	-30
		High	2483.5	-46.35	11.35	-57.7	-30
	24	Low	2400	-30.7	12.88	-43.58	-30
		High	2483.5	-40.8	12.88	-53.68	-30
	54	Low	2400	-29.33	12.34	-41.67	-30
		High	2483.5	-38.39	12.34	-50.73	-30

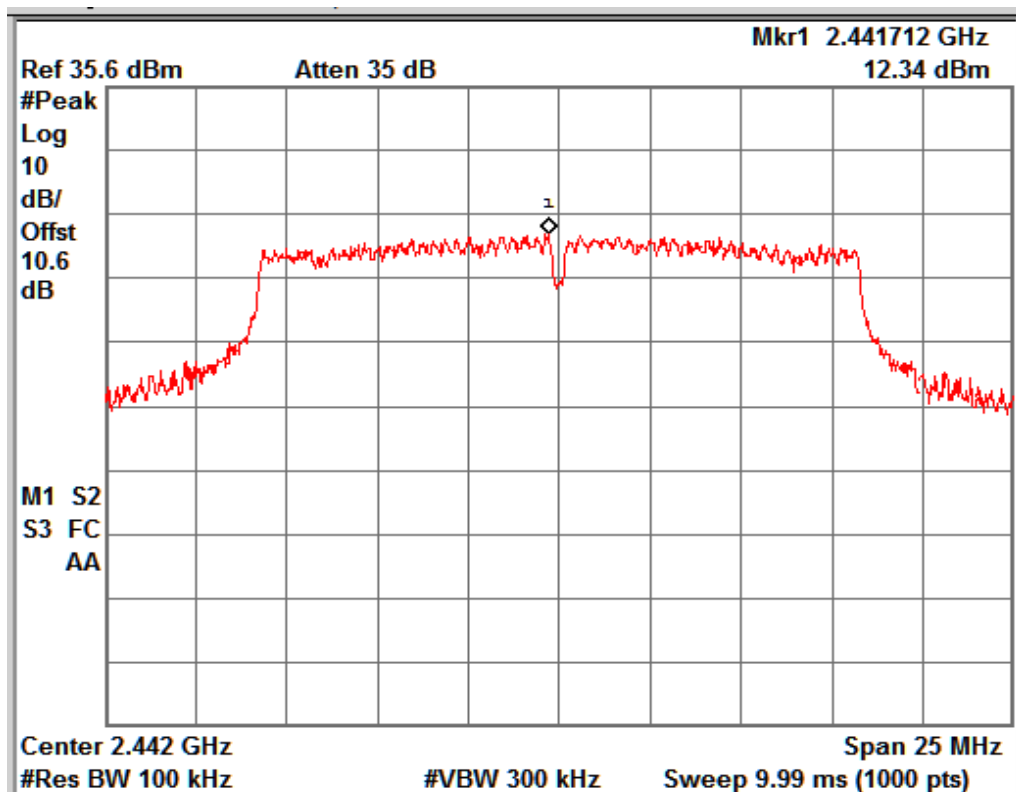
Note: The Channel no. 7 (2442 MHz) found to contain the maximum PSD level and is used to establish the reference level.



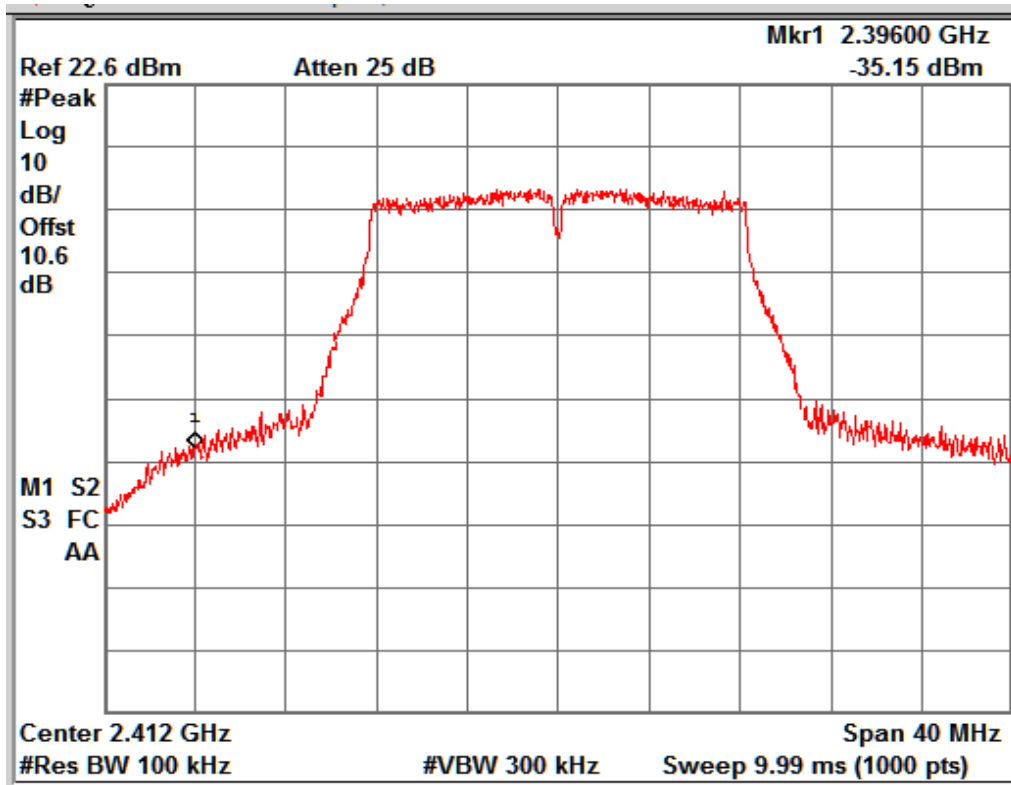
Reference Level Plot: 6 Mbps



Reference Level Plot: 24 Mbps

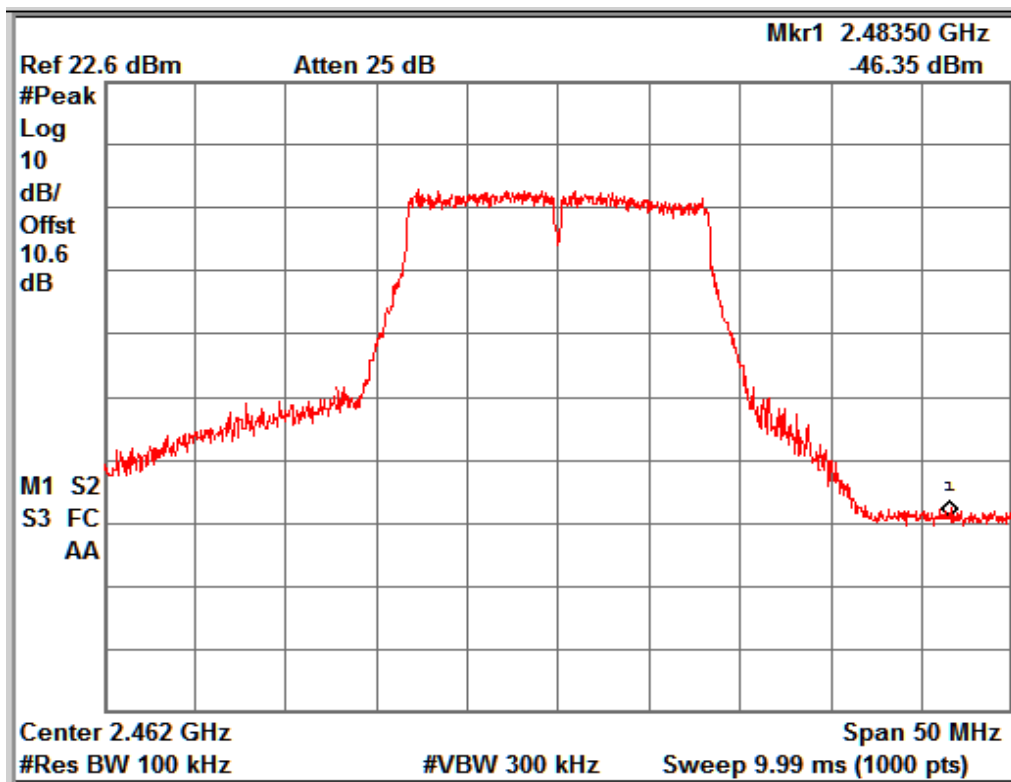


Reference Level Plot: 54 Mbps



Data Rate: 6 Mbps

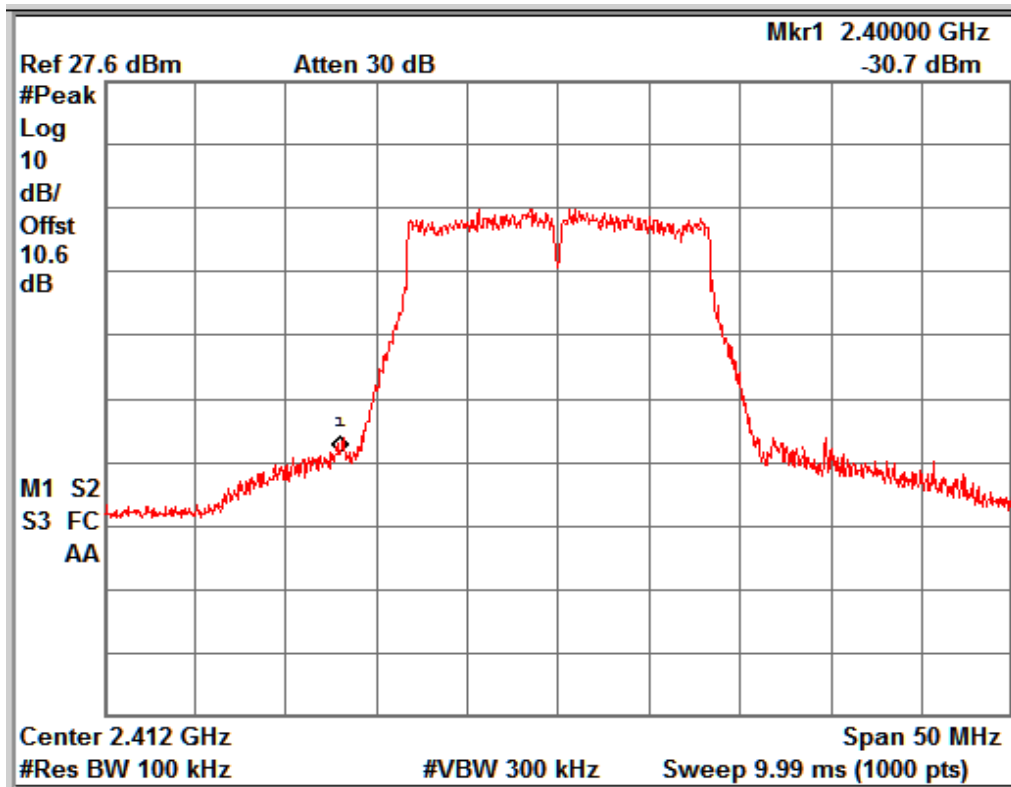
Channel Frequency: 2412



Data Rate: 6 Mbps

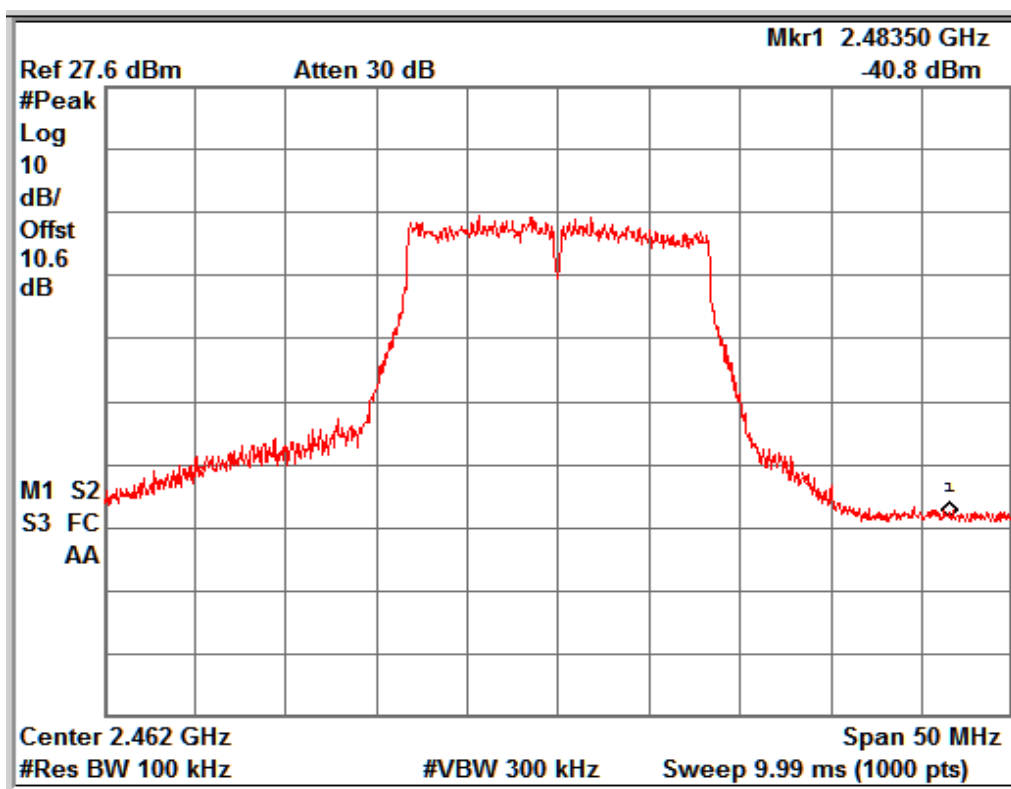
Channel Frequency: 2462

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Data Rate: 24 Mbps

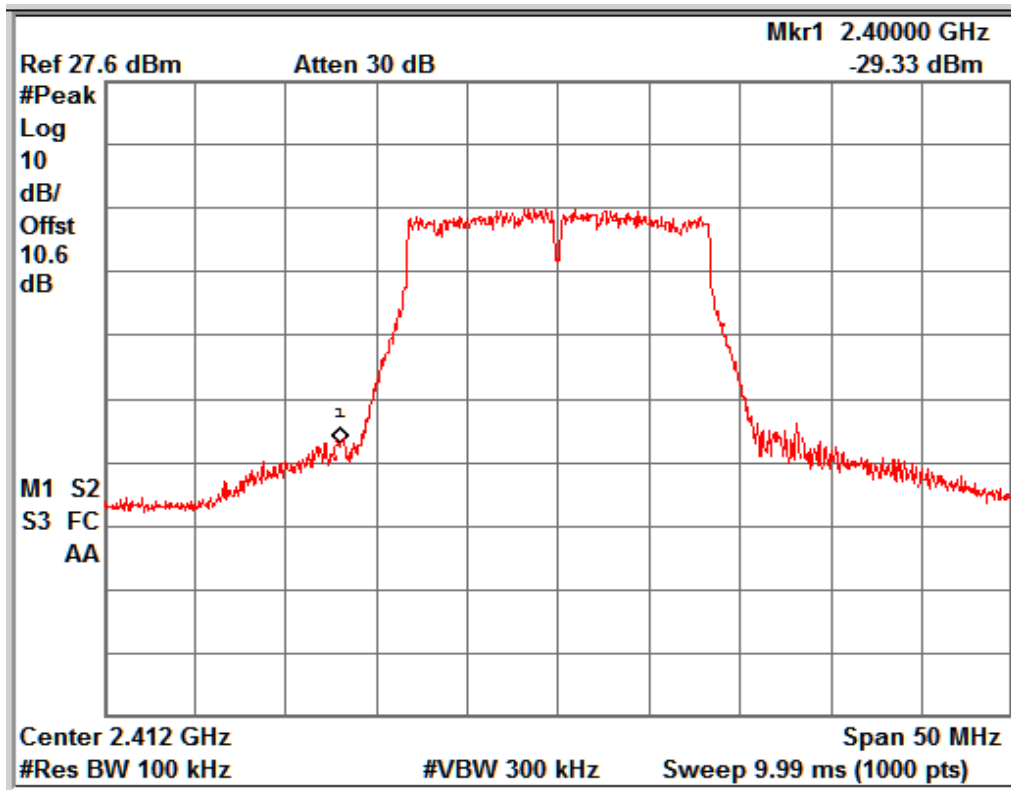
Channel Frequency: 2412



Data Rate: 24 Mbps

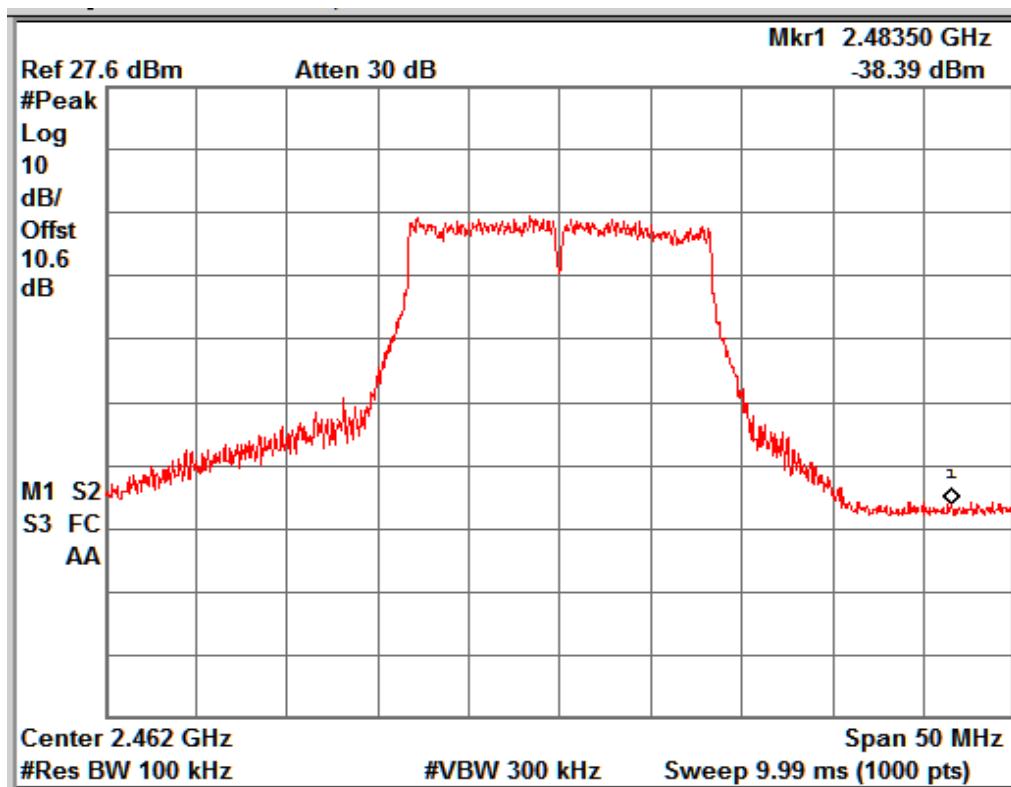
Channel Frequency: 2462

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Data Rate: 54 Mbps

Channel Frequency: 2412



Data Rate: 54 Mbps

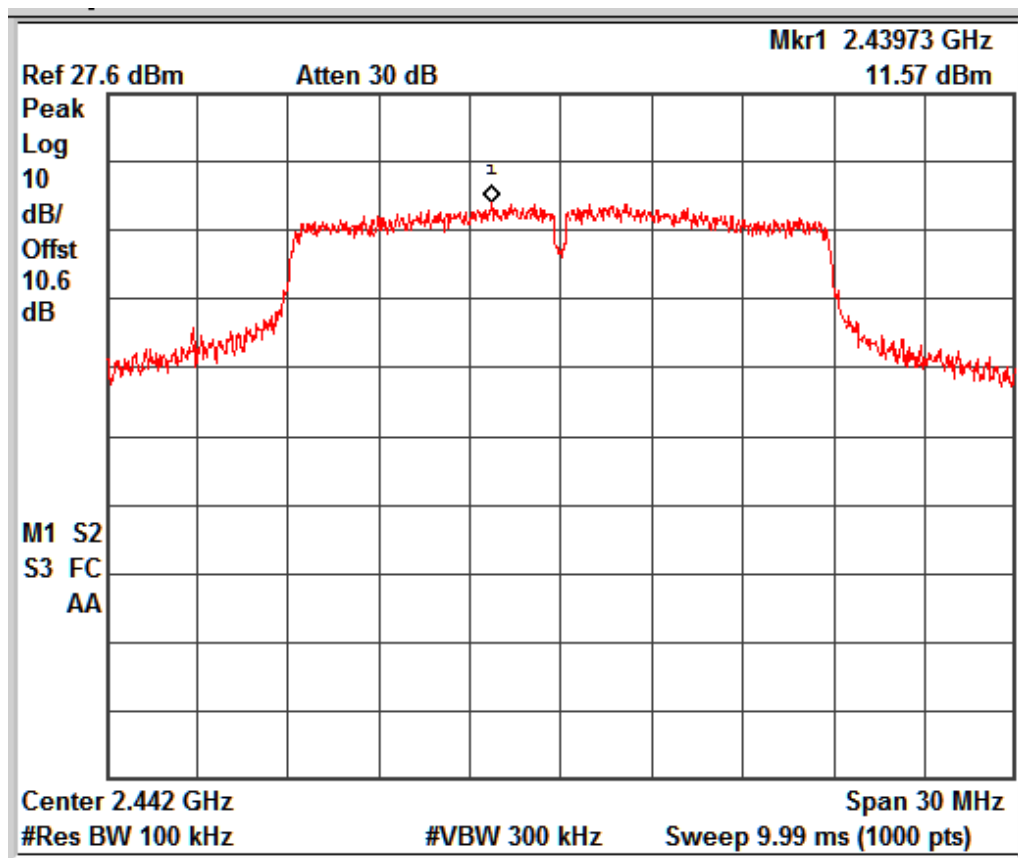
Channel Frequency: 2462

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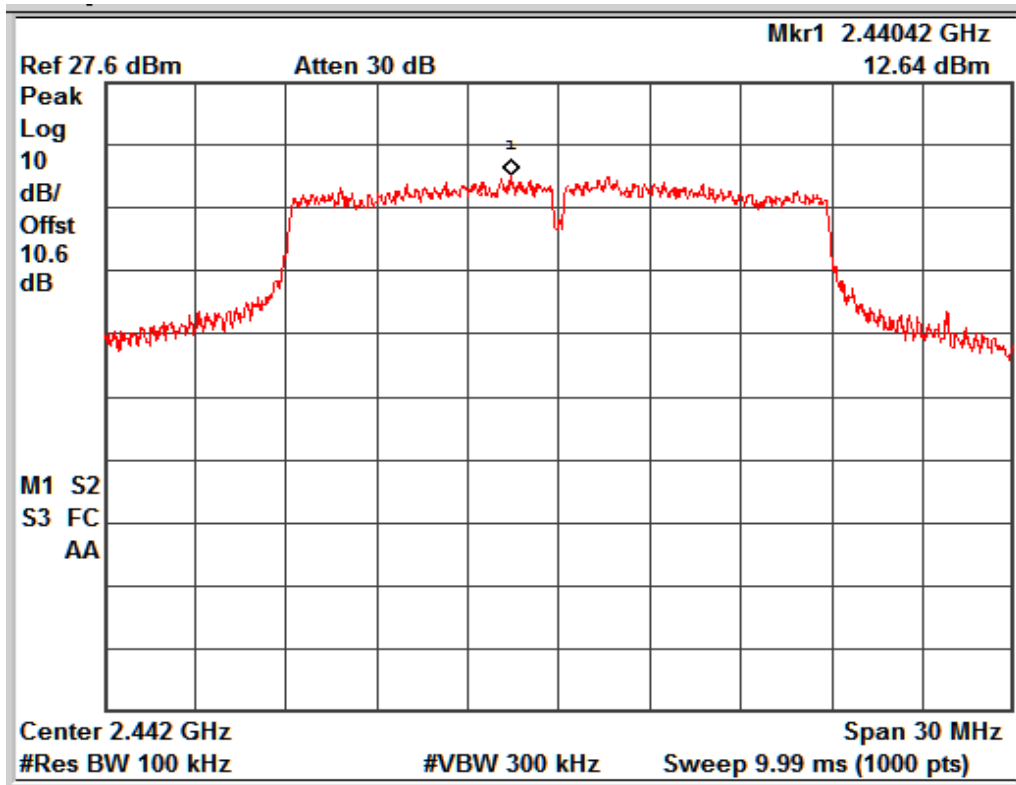
Result: n Mode

802.11 Protocol	Data Rate (Mbps)	Channel	Value at Band Edge		Reference Value B (dBm)	Band Edge Value A-B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
n Mode	MCS 0	Low	2400.00	-31.64	11.57	-43.21	-30
		High	2483.50	-49.11	11.57	-60.68	-30
	MCS 4	Low	2399.56	-27.05	12.64	-39.69	-30
		High	2483.50	-43.62	12.64	-56.26	-30
	MCS 7	Low	2400.00	-29.32	12.61	-41.93	-30
		High	2483.50	-39.58	12.61	-52.19	-30

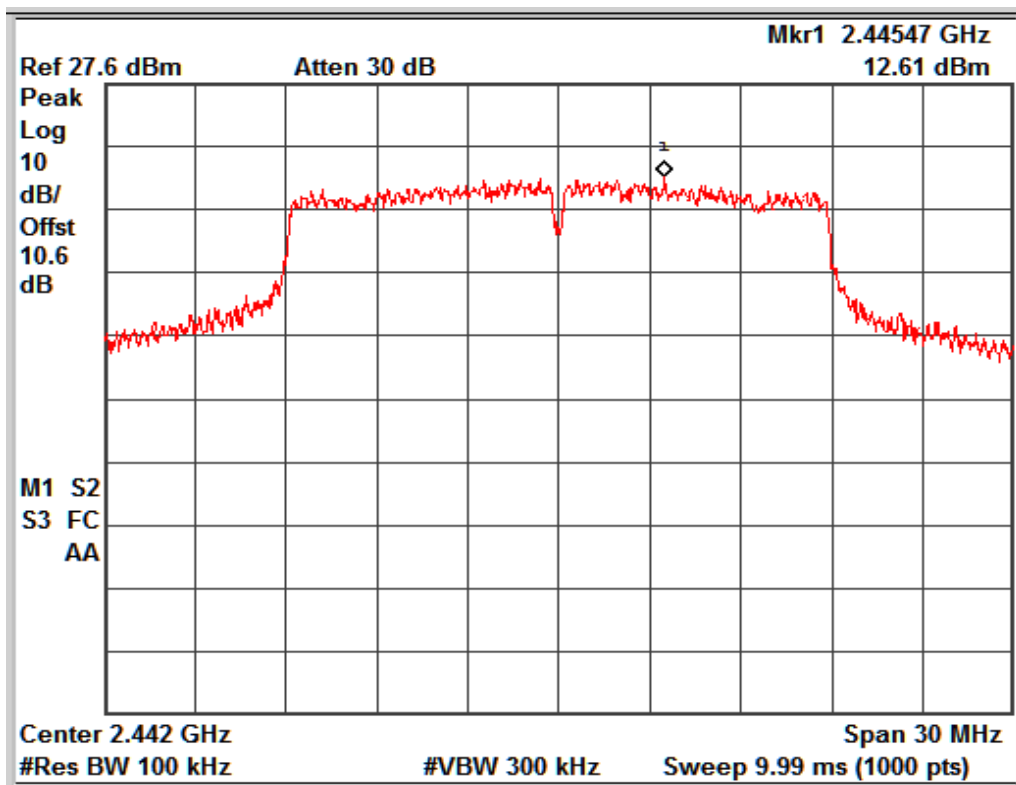
Note: The Channel no. 7 (2442 MHz) found to contain the maximum PSD level and is used to establish the reference level.



Reference Level Plot: MCS 0

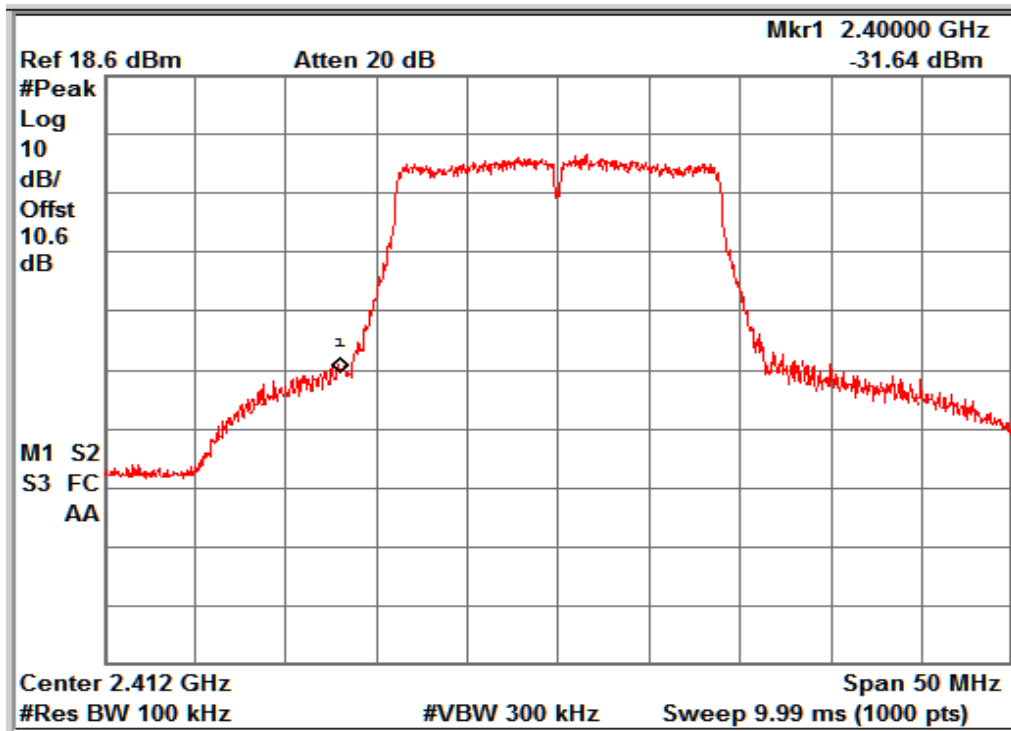


Reference Level Plot: MCS 4



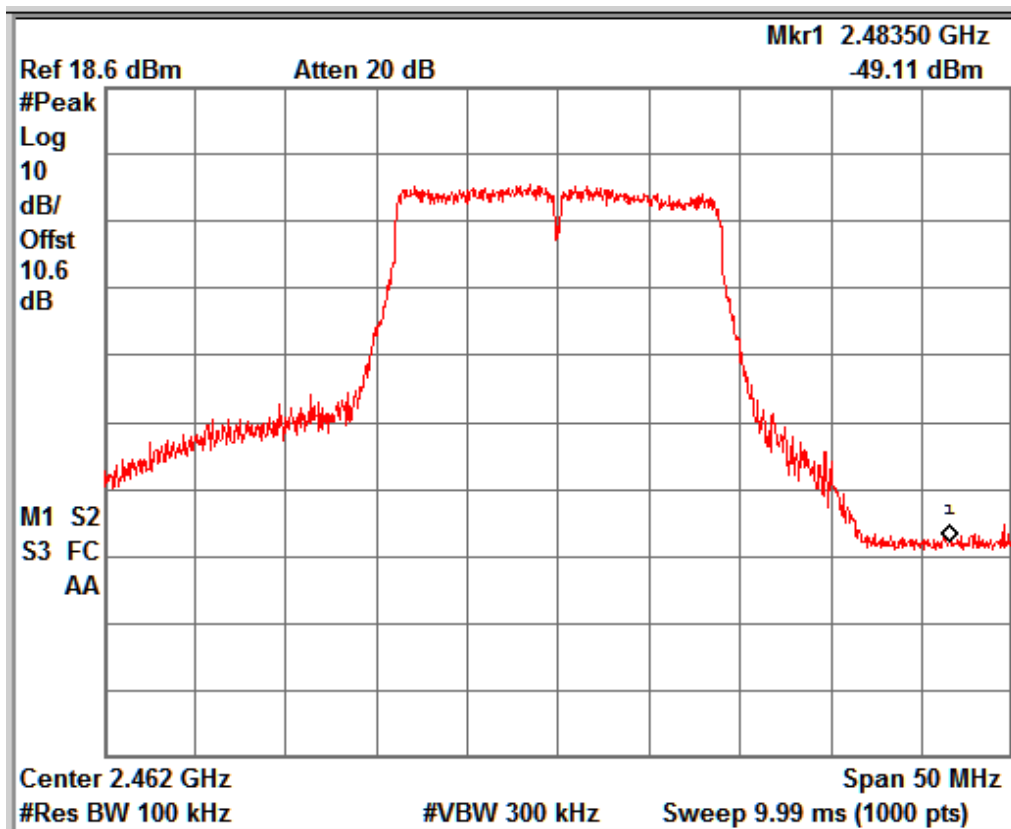
Reference Level Plot: MCS 7

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Data Rate: MCS 0

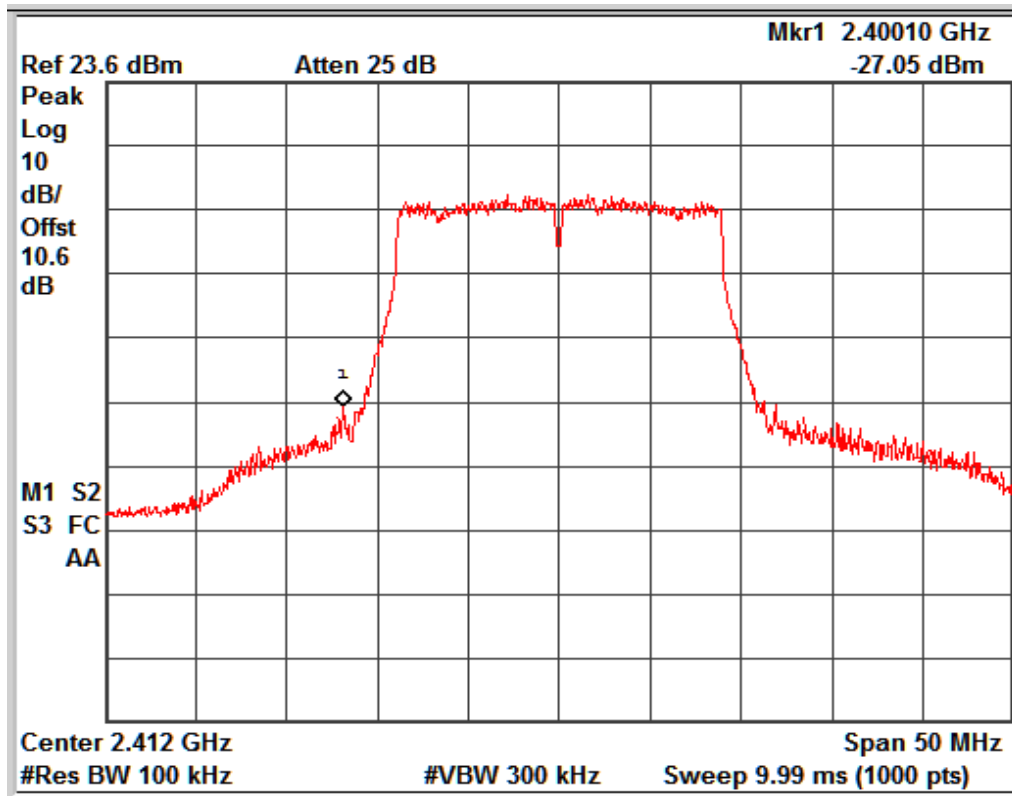
Channel Frequency: 2412



Data Rate: MCS 0

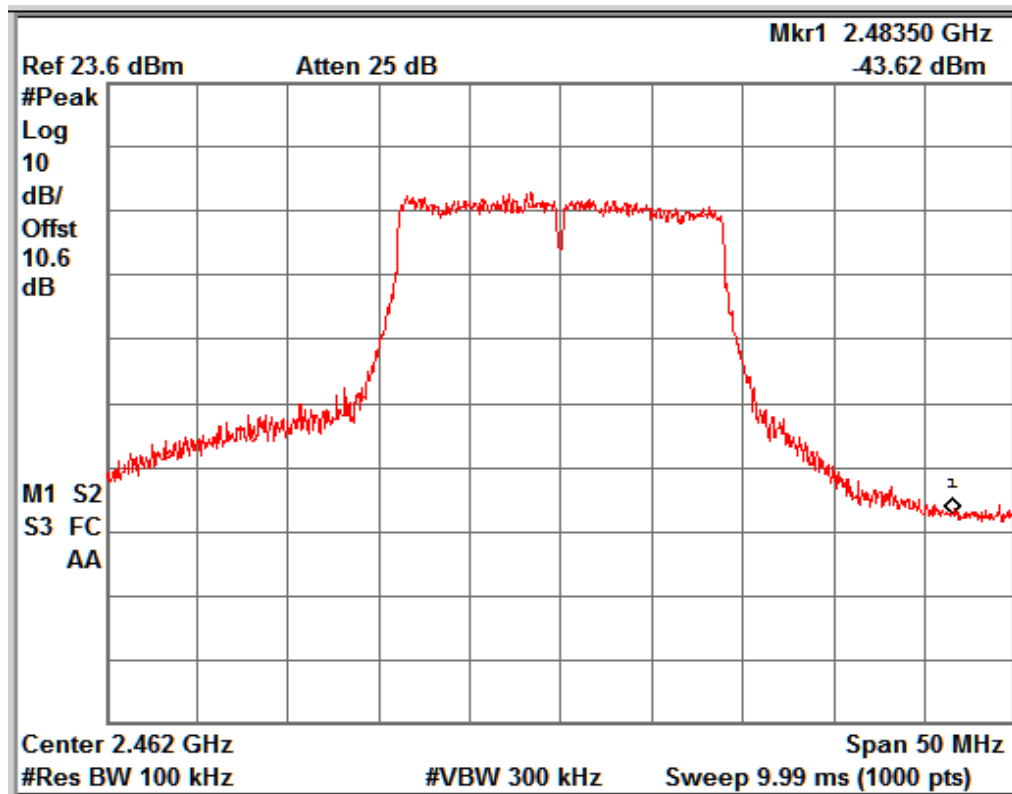
Channel Frequency: 2462

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Data Rate: MCS 4

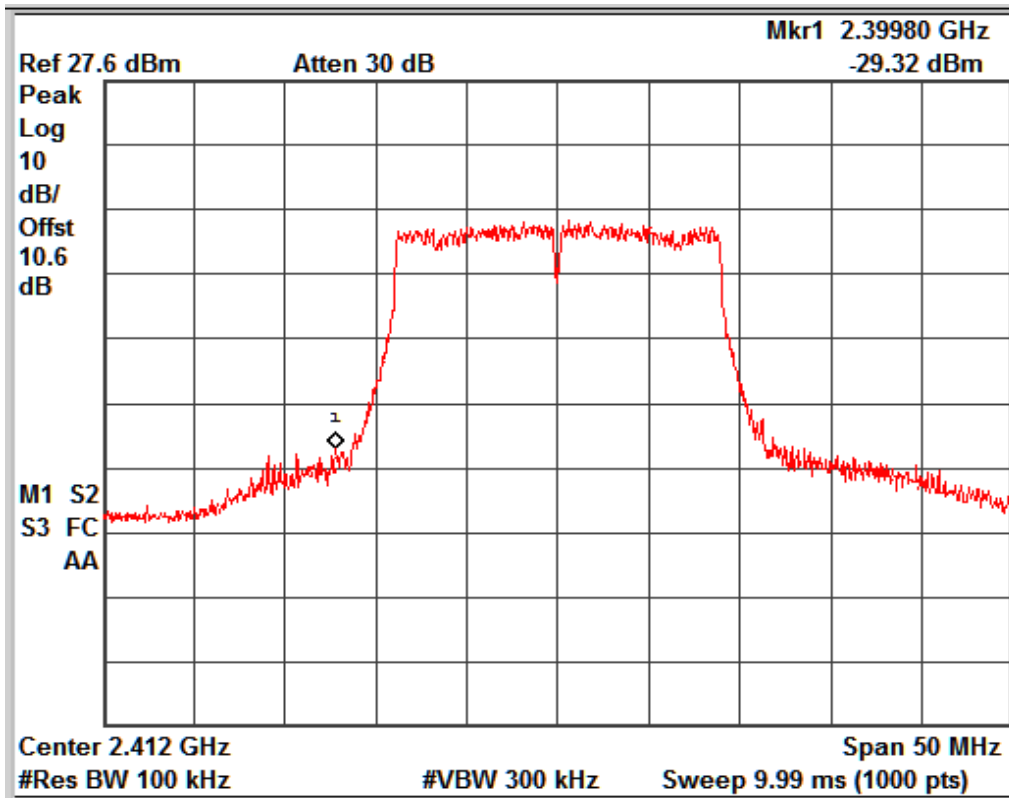
Channel Frequency: 2412



Data Rate: MCS 4

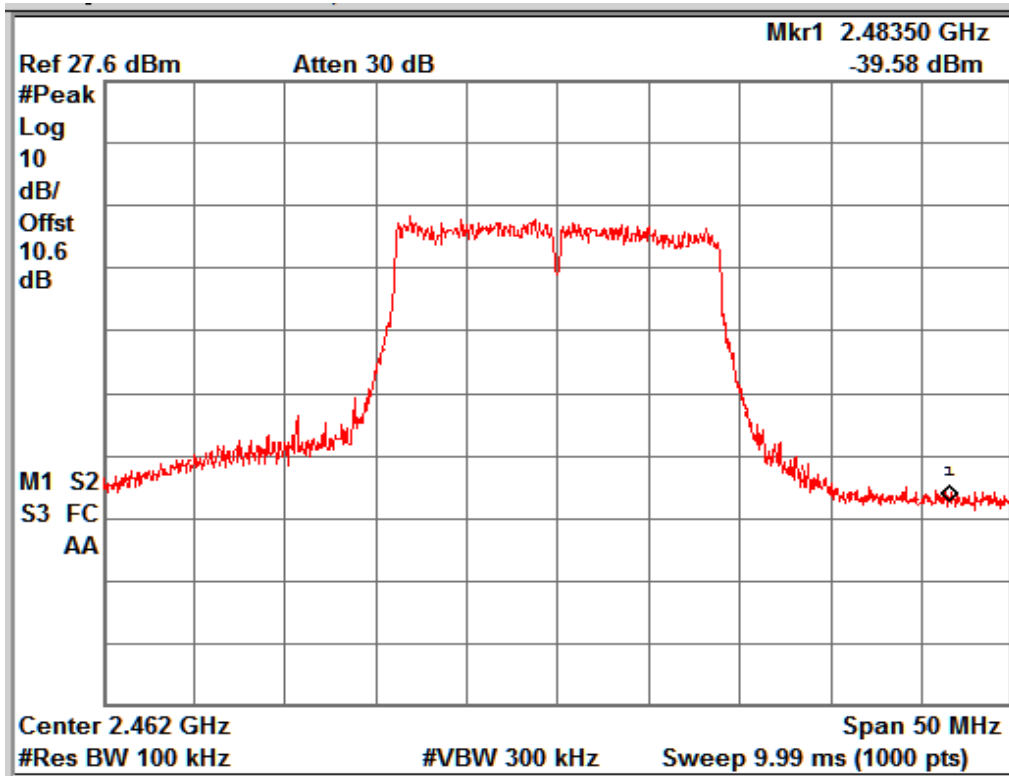
Channel Frequency: 2462

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Data Rate: MCS 7

Channel Frequency: 2412



Data Rate: MCS 7

Channel Frequency: 2462

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**Spurious Radiated Emissions and
Restricted Bands of Operation
Result**

**Section 15.209 and 15.205
Pass**

Test Specification	FCC Part 15 Section 15.209 & 15.205
Test Method	ANSI C63.10-2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Average for frequency above 1GHz
Requirement	As per the limits mentioned in the below table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88.50 – 53.80, 53.80 – 43.00 and 49.5dBμV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Channels

Low: 2412 MHz

Mid: 2442 MHz

High: 2462 MHz

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Test results:

For frequency Range 9kHz - 1 GHz

No emissions found in this frequency range.

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 Result: Above 1 GHz
 b Mode

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
1	Low	V	2390(Pk)	45.94	74	-28.06
			2390(Av)	39.52	54	-14.48
			2412(Pk)	90.49	-	-
			2412(Av)	87.70	-	-
			4824(Pk)	56.81	74	-17.19
			4824(Av)	53.21	54	-0.79
			7236(Pk)	58.41	74	-15.59
			7236(Av)	44.95	54	-9.05
		H	2390(Pk)	56.37	74	-17.63
			2390(Av)	51.20	54	-2.8
			2412(Pk)	104.49	-	-
			2412(Av)	101.57	-	-
			4824(Pk)	53.29	74	-20.71
			4824(Av)	47.02	54	-6.98
			7236(Pk)	59.20	74	-14.8
			7236(Av)	45.06	54	-8.94
	Mid	V	2442(Pk)	109.28	-	-
			2442(Av)	106.75	-	-
			4884(Pk)	54.07	74	-19.93
			4884(Av)	47.98	54	-6.02
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	103.13	-	-
			2442(Av)	100.48	-	-
			4884(Pk)	52.47	74	-21.53
			4884(Av)	45.60	54	-8.4
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	49.96	74	-24.04
			2483.5(Av)	33.11	54	-20.89
			2462(Pk)	94.47	-	-
			2462(Av)	86.43	-	-
			4924(Pk)	56.73	74	-17.27
			4924(Av)	52.29	54	-1.71
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	57.73	74	-16.27
			2483.5(Av)	46.44	54	-7.56
			2462(Pk)	109.02	-	-
			2462(Av)	100.75	-	-
			4924(Pk)	53.74	74	-20.26
			4924(Av)	46.16	54	-7.84
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
11	Low	V	2390(Pk)	44.64	74	-29.36
			2390(Av)	32.97	54	-21.03
			2412(Pk)	94.50	-	-
			2412(Av)	86.59	-	-
			4824(Pk)	58.94	74	-15.06
			4824(Av)	46.32	54	-7.68
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	57.73	74	-16.27
			2390(Av)	46.61	54	-7.39
			2412(Pk)	109.02	-	-
			2412(Av)	100.88	-	-
			4824(Pk)	55.58	74	-18.42
			4824(Av)	42.21	54	-11.79
			7236(Pk)	No Emissions Found		
			7236(Av)			
	Mid	V	2442(Pk)	120	-	-
			2442(Av)	112.26	-	-
			4884(Pk)	62.80	74	-11.2
			4884(Av)	50.6	54	-3.4
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	112.97	-	-
			2442(Av)	105.21	-	-
			4884(Pk)	55.04	74	-18.96
			4884(Av)	42.04	54	-11.96
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	44.21	74	-29.79
			2483.5(Av)	34.20	54	-19.8
			2462(Pk)	95.82	-	-
			2462(Av)	87.85	-	-
			4924(Pk)	58.20	74	-15.8
			4924(Av)	46.05	54	-7.95
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	56.19	74	-17.81
			2483.5(Av)	47.31	54	-6.69
			2462(Pk)	110.25	-	-
			2462(Av)	102.52	-	-
			4924(Pk)	52.99	74	-21.01
			4924(Av)	40.78	54	-13.22
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
6	Low	V	2390(Pk)	50.63	74	-23.37
			2390(Av)	35.81	54	-18.19
			2412(Pk)	88.72	-	-
			2412(Av)	79.48	-	-
			4824(Pk)	55.74	74	-18.26
			4824(Av)	41.86	54	-12.14
			7236(Pk)	59.35	74	-14.65
			7236(Av)	45.34	54	-8.66
		H	2390(Pk)	65.58	74	-8.42
			2390(Av)	49.70	54	-4.3
			2412(Pk)	102.91	-	-
			2412(Av)	93.53	-	-
			4824(Pk)	52.10	74	-21.9
			4824(Av)	38.70	54	-15.3
			7236(Pk)	59.40	74	-14.6
			7236(Av)	45.05	54	-8.95
	Mid	V	2442(Pk)	119.06	-	-
			2442(Av)	109.61	-	-
			4884(Pk)	60.93	74	-13.07
			4884(Av)	47.68	54	-6.32
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	112.31	-	-
			2442(Av)	102.24	-	-
			4884(Pk)	53.94	74	-20.06
			4884(Av)	40.87	54	-13.13
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	57.56	74	-16.44
			2483.5(Av)	38.47	54	-15.53
			2462(Pk)	89.02	-	-
			2462(Av)	79.33	-	-
			4924(Pk)	54.77	74	-19.23
			4924(Av)	41.57	54	-12.43
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	70.92	74	-3.08
			2483.5(Av)	53.32	54	-0.68
			2462(Pk)	103.74	-	-
			2462(Av)	94.04	-	-
			4924(Pk)	52.05	74	-21.95
			4924(Av)	38.70	54	-15.3
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
24	Low	V	2390(Pk)	48.66	74	-25.34
			2390(Av)	35.65	54	-18.35
			2412(Pk)	89.91	-	-
			2412(Av)	79.37	-	-
			4824(Pk)	55.38	74	-18.62
			4824(Av)	42.15	54	-11.85
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	66.91	74	-7.09
			2390(Av)	50.26	54	-3.74
			2412(Pk)	104.04	-	-
			2412(Av)	93.54	-	-
			4824(Pk)	51.82	74	-22.18
			4824(Av)	38.8	54	-15.2
			7236(Pk)	No Emissions Found		
			7236(Av)			
	Mid	V	2442(Pk)	119.76	-	-
			2442(Av)	109.2	-	-
			4884(Pk)	60	74	-14
			4884(Av)	48.16	54	-5.84
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	113.09	-	-
			2442(Av)	102.16	-	-
			4884(Pk)	54.25	74	-19.75
			4884(Av)	40.92	54	-13.08
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	50.66	74	-23.34
			2483.5(Av)	31.93	54	-22.07
			2462(Pk)	82.01	-	-
			2462(Av)	71.34	-	-
			4924(Pk)	55.07	74	-18.93
			4924(Av)	41.51	54	-12.49
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	69.49	74	-4.51
			2483.5(Av)	52.4	54	-1.6
			2462(Pk)	104.42	-	-
			2462(Av)	94.13	-	-
			4924(Pk)	51.89	74	-22.11
			4924(Av)	38.91	54	-15.09
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarisation	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
54	Low	V	2390(Pk)	54.64	74	-19.36
			2390(Av)	36.76	54	-17.24
			2412(Pk)	89.55	-	-
			2412(Av)	79.55	-	-
			4824(Pk)	54.17	74	-19.83
			4824(Av)	42.04	54	-11.96
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	67.43	74	-6.57
			2390(Av)	49.88	54	-4.12
			2412(Pk)	103.86	-	-
			2412(Av)	93.77	-	-
			4824(Pk)	51.04	74	-22.96
			4824(Av)	39.14	54	-14.86
			7236(Pk)	No Emissions Found		
			7236(Av)			
	Mid	V	2442(Pk)	119.26	-	-
			2442(Av)	109.25	-	-
			4884(Pk)	60.03	74	-13.97
			4884(Av)	48.24	54	-5.76
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	112.21	-	-
			2442(Av)	102.53	-	-
			4884(Pk)	53.68	74	-20.32
			4884(Av)	40.86	54	-13.14
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	52.25	74	-21.75
			2483.5(Av)	36.87	54	-17.13
			2462(Pk)	89.39	-	-
			2462(Av)	79.66	-	-
			4924(Pk)	54.96	74	-19.04
			4924(Av)	41.87	54	-12.13
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	68.42	74	-5.58
			2483.5(Av)	52.72	54	-1.28
			2462(Pk)	103.72	-	-
			2462(Av)	94.21	-	-
			4924(Pk)	52.56	74	-21.44
			4924(Av)	38.83	54	-15.17
			7386(Pk)	No Emissions Found		
			7386(Av)			

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Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
MCS0	Low	V	2390(Pk)	58.74	74	-15.26
			2390(Av)	37.87	54	-16.13
			2412(Pk)	87.87	-	-
			2412(Av)	78.49	-	-
			4824(Pk)	54.4	74	-19.6
			4824(Av)	41.04	54	-12.96
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	70.34	74	-3.66
			2390(Av)	50.87	54	-3.13
			2412(Pk)	101.2	-	-
			2412(Av)	92.6	-	-
			4824(Pk)	51.83	74	-22.17
			4824(Av)	38.74	54	-15.26
			7236(Pk)	No Emissions Found		
			7236(Av)			
	High	V	2483.5(Pk)	59.3	74	-14.7
			2483.5(Av)	39.35	54	-14.65
			2462(Pk)	89.27	-	-
			2462(Av)	79.76	-	-
			4924(Pk)	59.03	74	-14.97
			4924(Av)	45.13	54	-8.87
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	72.21	74	-1.79
			2483.5(Av)	53.62	54	-0.38
			2462(Pk)	101.85	-	-
			2462(Av)	92.77	-	-
			4924(Pk)	52.78	74	-21.22
			4924(Av)	39.51	54	-14.49
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
MCS4	Low	V	2390(Pk)	55.95	74	-18.05
			2390(Av)	40.55	54	-13.45
			2412(Pk)	92.30	-	-
			2412(Av)	82.43	-	-
			4824(Pk)	52.54	74	-21.46
			4824(Av)	41.26	54	-12.74
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	66.77	74	-7.23
			2390(Av)	50.98	54	-3.02
			2412(Pk)	102.58	-	-
			2412(Av)	92.16	-	-
			4824(Pk)	53.96	74	-20.04
			4824(Av)	41.22	54	-12.78
			7236(Pk)	No Emissions Found		
			7236(Av)			
	Mid	V	2442(Pk)	120.04	-	-
			2442(Av)	109.40	-	-
			4884(Pk)	60.51	74	-13.49
			4884(Av)	47.88	54	-6.12
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	113.02	-	-
			2442(Av)	102.28	-	-
			4884(Pk)	52.96	74	-21.04
			4884(Av)	40.75	54	-13.25
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	55.51	74	-18.49
			2483.5(Av)	41.26	54	-12.74
			2462(Pk)	89.25	-	-
			2462(Av)	79.19	-	-
			4924(Pk)	53.57	74	-20.43
			4924(Av)	40.98	54	-13.02
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	66.79	74	-7.21
			2483.5(Av)	51.88	54	-2.12
			2462(Pk)	103.12	-	-
			2462(Av)	92.18	-	-
			4924(Pk)	51.79	74	-22.21
			4924(Av)	38.57	54	-15.43
			7386(Pk)	No Emissions Found		
			7386(Av)			

Data rates (Mbps)	channel	Polarization	Frequency (MHz)	Emission Value (dBuV/m)	Limit (dBm)	Margin (dB)
MCS7	Low	V	2390(Pk)	56.03	74	-17.97
			2390(Av)	39.21	54	-14.79
			2412(Pk)	91.27	-	-
			2412(Av)	79.65	-	-
			4824(Pk)	53.71	74	-20.29
			4824(Av)	41.17	54	-12.83
			7236(Pk)	No Emissions Found		
			7236(Av)			
		H	2390(Pk)	65.97	74	-8.03
			2390(Av)	50.67	54	-3.33
			2412(Pk)	103.2	-	-
			2412(Av)	91.73	-	-
			4824(Pk)	51.90	74	-22.1
			4824(Av)	38.62	54	-15.38
			7236(Pk)	No Emissions Found		
			7236(Av)			
	Mid	V	2442(Pk)	120.57	-	-
			2442(Av)	109.52	-	-
			4884(Pk)	60.74	74	-13.26
			4884(Av)	47.49	54	-6.51
			7326(Pk)	No Emissions Found		
			7326(Av)			
		H	2442(Pk)	113.74	-	-
			2442(Av)	102.55	-	-
			4884(Pk)	53.85	74	-20.15
			4884(Av)	40.90	54	-13.1
			7326(Pk)	No Emissions Found		
			7326(Av)			
	High	V	2483.5(Pk)	54.49	74	-19.51
			2483.5(Av)	41.34	54	-12.66
			2462(Pk)	90.80	-	-
			2462(Av)	80.13	-	-
			4924(Pk)	52.9	74	-21.1
			4924(Av)	40.91	54	-13.09
			7386(Pk)	No Emissions Found		
			7386(Av)			
		H	2483.5(Pk)	67.79	74	-6.21
			2483.5(Av)	51.93	54	-2.07
			2462(Pk)	102.44	-	-
			2462(Av)	92.61	-	-
			4924(Pk)	51.77	74	-22.23
			4924(Av)	38.45	54	-15.55
			7386(Pk)	No Emissions Found		
			7386(Av)			

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**Conducted Emission Test on A.C. Power Line
Result**

**Section 15.207
Pass**

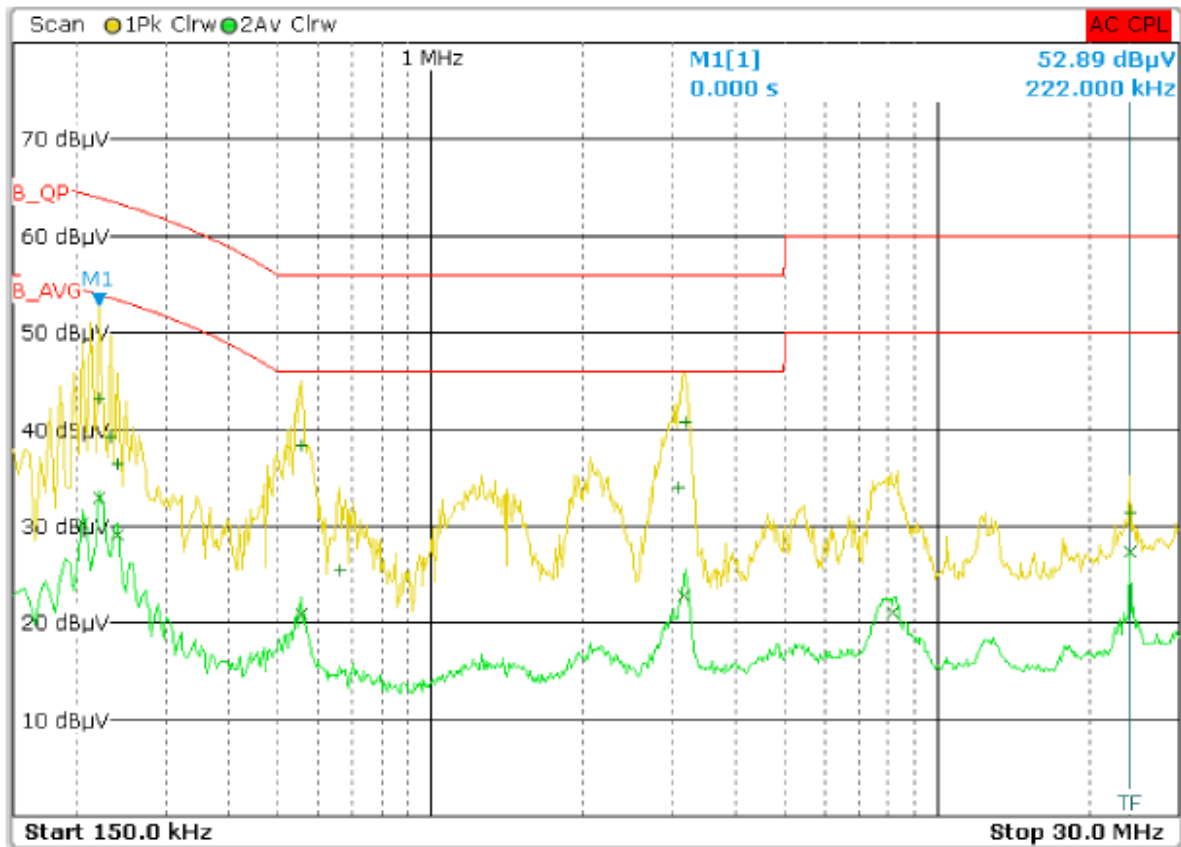
Test Specification : FCC Part 15 Section 15.207
Test Method : ANSI C63.10-2013
Testing Location : Screened room
Measurement Bandwidth : 9kHz
Frequency Range : 150kHz – 30MHz
Supply Voltage : 110VAC,60Hz

Limit of section 15.207

Frequency of emission (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V/m)
0.15 – 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency

Test Result:

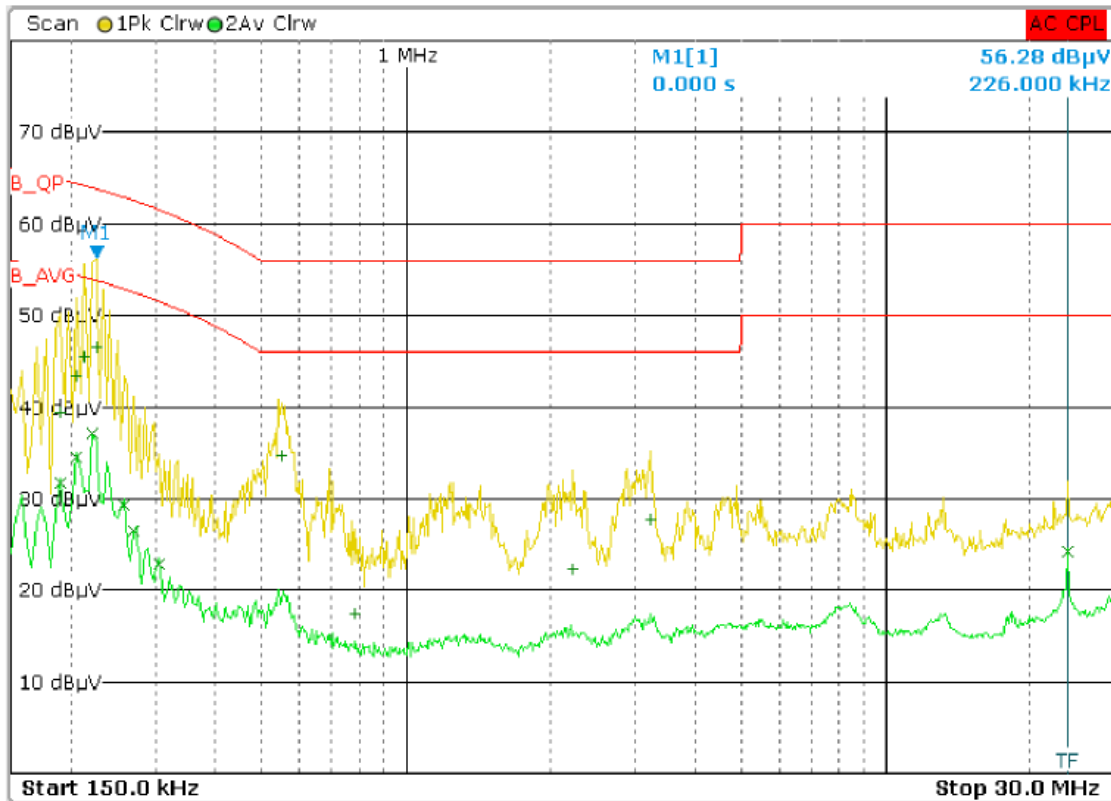


Line Graph

Scan Start	150.00000000 kHz						
Scan Stop	30.000000000 MHz						
Scan Type	LIN						
Transducer	ENV216_Line						
Detector	Trace 1: Max Peak Trace 2: Average						
Start	Stop	Step Size	RBW	Meas Time	RF Atten	Preamp	Input
Frequency	Frequency						
150.000 kHz	30.000 MHz	4.000 kHz	9.0 kHz	10.0 ms	10.0 dB	0.0 dB	INPUT1

Final Results

Meas Time	1.0 s						
Margin	6.0 dB						
Peaks	25						
Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB		
1	3.190000000 MHz	40.82		Quasi Peak	-15.18		
1	554.000000000 kHz	38.43		Quasi Peak	-17.57		
1	222.000000000 kHz	43.16		Quasi Peak	-20.78		
2	222.000000000 kHz	32.91		Average	-21.03		
1	3.082000000 MHz	33.94		Quasi Peak	-22.06		
2	23.998000000 MHz	27.31		Average	-22.69		
2	3.166000000 MHz	22.79		Average	-23.21		
2	206.000000000 kHz	30.33		Average	-24.07		
2	242.000000000 kHz	29.15		Average	-24.22		
1	234.000000000 kHz	39.23		Quasi Peak	-24.37		
2	554.000000000 kHz	20.94		Average	-25.06		
1	242.000000000 kHz	36.48		Quasi Peak	-26.89		
1	24.002000000 MHz	31.34		Quasi Peak	-28.66		
2	8.162000000 MHz	21.06		Average	-28.94		
1	662.000000000 kHz	25.47		Quasi Peak	-30.53		

Line: Table

Neutral: Graph

Scan Start	150.00000000 kHz						
Scan Stop	30.000000000 MHz						
Scan Type	LIN						
Transducer	ENV216_Neutral						
Detector	Trace 1: Max Peak Trace 2: Average						
Start Frequency	Stop Frequency	Step Size	RBW	Meas Time	RF Atten	Preampl	Input
150.000 kHz	30.000 MHz	4.000 kHz	9.0 kHz	10.0 ms	10.0 dB	0.0 dB	INPUT1

Final Results							
Meas Time		1.0 s					
Margin		6.0 dB					
Peaks		25					
Trace	Frequency	Level (dBμV)	Phase	Detector	Delta Limit/dB		
2	222.000000000 kHz	37.04		Average	-16.90		
1	226.000000000 kHz	46.59		Quasi Peak	-17.24		
1	214.000000000 kHz	45.44		Quasi Peak	-18.73		
2	206.000000000 kHz	34.48		Average	-19.92		
1	206.000000000 kHz	43.41		Quasi Peak	-20.99		
1	550.000000000 kHz	34.65		Quasi Peak	-21.35		
2	190.000000000 kHz	31.68		Average	-23.18		
2	258.000000000 kHz	29.27		Average	-23.64		
1	190.000000000 kHz	39.46		Quasi Peak	-25.40		
2	24.002000000 MHz	24.18		Average	-25.82		
2	270.000000000 kHz	26.54		Average	-26.03		
1	3.238000000 MHz	27.72		Quasi Peak	-28.28		
2	306.000000000 kHz	22.83		Average	-28.71		
1	2.218000000 MHz	22.25		Quasi Peak	-33.75		
1	786.000000000 kHz	17.44		Quasi Peak	-38.56		

Neutral: Table

Power level setting used during the test.

Mode	Data Rate (Mbps)	Channels		
		Low	Middle	High
802.11b	1	17 dBm	15 dBm	18 dBm
	11	22 dBm	22 dBm	22 dBm
802.11g	6	18 dBm	22 dBm	18 dBm
	24	18 dBm	22 dBm	18 dBm
	54	18 dBm	22 dBm	18 dBm
802.11n	MSC 0	17 dBm	22 dBm	17 dBm
	MSC 4	17 dBm	22 dBm	17 dBm
	MCS 7	17 dBm	22 dBm	17 dBm

***** END OF TEST REPORT*****