



Produkte
Products

Prüfbericht - Nr.: 19660011 001		Seite 1 von 91	
<i>Test Report No.:</i>		<i>Page 1 of 91</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>	802.11 bgn Connection MODULE		
Bezeichnung: <i>Identification:</i>	RS9110-N-11-24	Serien-Nr.: <i>Serial No.</i>	Engineering Sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	1803006281	Eingangsdatum: <i>Date of receipt:</i>	28.05.2013
Prüfart: <i>Testing location:</i>	Refer Page 4 of 91 for test facilities		
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15: Subpart C Section 15.247 ANSI C63.4-2003		
Prüfresultat: <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:	
28.06.2013	Vinay N Test Engineer	01.07.2013	Raghavendra Kulkarni Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
			
Sonstiges / Other Aspects: FCC ID : XF6-RS9110N1124			
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>			

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Test Result Summary

Clause	Test Item	Result
FCC 15.247(b) (3)	Maximum Peak Conducted Output Power	Pass
FCC 15.247(a) (2)	6dB Bandwidth	Pass
FCC 15.247(e)	Maximum Power Spectral Density	Pass
FCC 15.247(d)	Band-edge compliance	Pass
FCC 15.209 / FCC 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass

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List of Test and Measurement Instruments

TUV Rheinland (India) Pvt. Ltd. , Bangalore

Equipment	Manufacturer	Model	S/N	Calibration Due Date
EMI Test Receiver	Rohde &Schwarz	ESU 40	100288	04.10.2013
Hybrid Log Periodic antenna	ETS Lindgren	3142D	00081354	26.07.2013
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	23.03.2014
Double-Ridged Waveguide Horn Antenna	ETS Lindgren	116794	00133356	01.09.2013
Emission Horn Antenna	ETS Lindgren	116706	00107323	24.08.2013
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	11.04.2014
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	21.03.2014

Testing Facilities:

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

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General Product Information

Product Function and Intended Use

The RS9110-N-11-24 module is a IEEE 802.11bgn based WLAN device that directly provides a wireless interface to any equipment with a UART or SPI interface for data transfer. It integrates a MAC, baseband processor, RF transceiver with power amplifier in hardware; and all WLAN protocol and configuration functionality, networking stack in embedded firmware to make a fully self-contained 802.11n WLAN solution for a variety of applications. Applications:

- Seamless Wi-Fi connectivity for Application Processors
- Industrial M2M communications
- Point of Sale Terminals
- Metering (Parking Meters, Utility Meters, Power Meters, etc.)
- Security Cameras and Surveillance Equipment
- Logistics and Freight Management
- Warehousing
- Digital Picture Frames
- Several medical applications including Patient Monitoring, Remote Diagnostics

Ratings and System Details

Operating Frequency Range	2400MHz – 2483.50MHz	
No. of channel	13 (Refer Table 1)	
Channel Spacing	5MHz	
Transmitted Power	802.11b	20.44 dBm
	802.11g	20.75 dBm
	802.11n	20.96 dBm
Data Rate	802.11b: 1,2, 5.5,11 Mbps 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: 6.5, 14.4, 21.7, 28.9, 39, 57.8, 65Mbps	
Number of antenna	Two	
Antenna Gain and Antenna type	(Refer Table 2)	
Supply Voltage to Module	3.1V – 3.6V DC from Host device	
Environmental	Operational Temperature: -40°C to 85° C	

Test Conditions:

Supply Voltage: 5V DC from USB

Environmental conditions:

Temperature: +23 °C RH: 62%

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Operation Descriptions

The RS9110-N-11-24 module from Redpine's Connect-io-n™ family of products is a complete IEEE 802.11bgn based wireless device server that directly provides a wireless interface to any equipment with a UART or SPI interface for data transfer. It integrates a MAC, baseband processor, RF transceiver with power amplifier; and all WLAN protocol and configuration functionality, TCP/IP stack in embedded firmware to make an 802.11n WLAN solution for a variety of applications. No WLAN, configuration or networking functionality is required on the host system or data source. Based on Redpine Signals' RS9110 SoC that includes an embedded processor; it is designed to provide standards compliant wireless connectivity to devices and systems such as industrial equipment, medical electronic systems, POS equipment, sensor networks and metering equipment, M2M communications, and remote configuration applications. As a wireless serial modem, the RS9110-N-11-24 originates and terminates TCP and UDP connections, enabling a variety of M2M applications at low cost and small footprint. It uniquely provides connectivity in the single stream 802.11n mode, preserving overall network throughput in the emerging enterprise environments.

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Test Set-up and Operation Mode

Principle of Configuration Selection

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

Test Operation and Test Software

Hyper terminal in the computer 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.

Special Accessories and Auxiliary Equipment

- None

Countermeasures to achieve EMC Compliance

- The channels 12 and 13 were tested with reduced power levels to achieve the compliance. The detailed GC values with respect to data rates are tabulated in page 91 of 91 of this report.

Test Modes – Data Rates and Modulations

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

Table of frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400 – 2483.5 MHz	1	2412
	2	2417
	3	2422
	4	2427
	5	2432
	6	2437
	7	2442
	8	2447
	9	2452
	10	2457
	11	2462
	12	2467
	13	2472

Table 1

Antennas Used

Antenna Number	Make	Model/Part #	Antenna Gain (dBi)	Type of Antenna
Antenna 1	Antenna Factor	ANT-2.45-CHP-x	0.5dBi	Chip antenna
Antenna 2	Pulse	W1043	2 dBi	External antenna

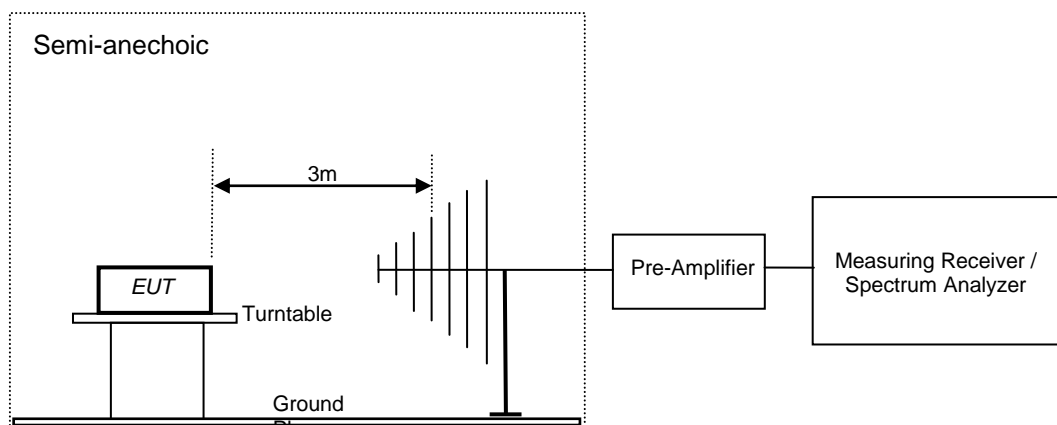
Table 2

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Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.4-2003. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, 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.



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Test Results

Maximum Peak Conducted Output Power

Section 15.247(b) (3)

Result

Pass

Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	3 MHz
Requirement	<1 watt (30dBm).

Test Method:

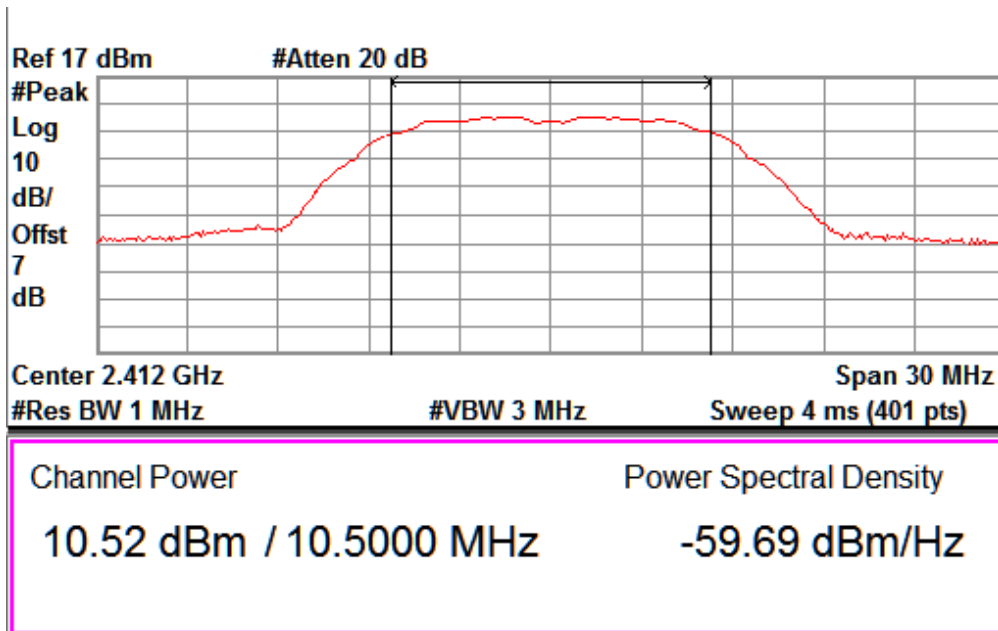


Note: For measurement of Maximum Peak conducted output power method Option 1 was used

Test Result:

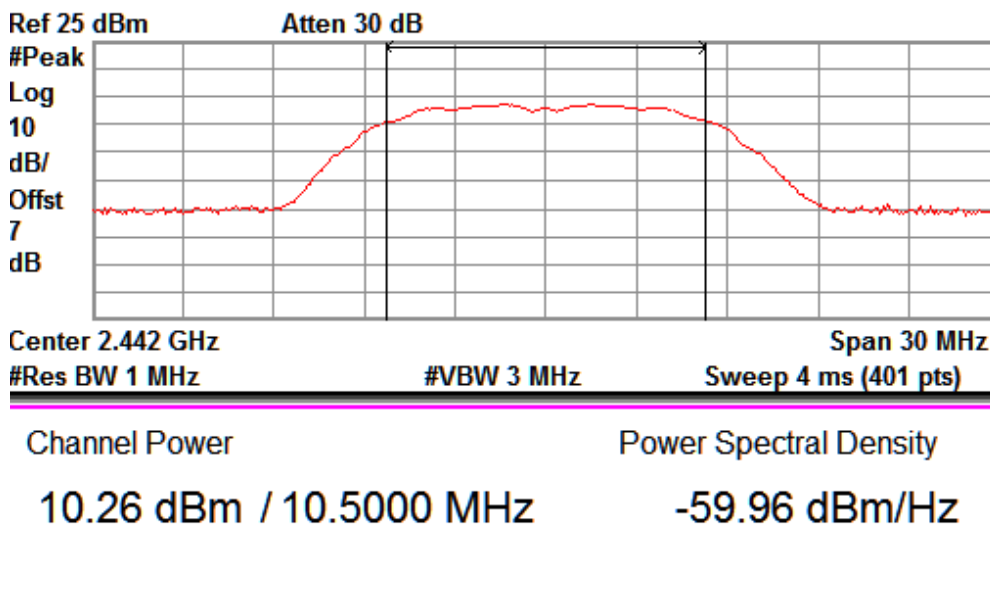
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total Power (dBm)	Limit (dBm)	Margin (dB)
b	1	2412.00	10.52	30.00	-19.48
		2442.00	10.26	30.00	-19.74
		2472.00	9.64	30.00	-20.36
	11	2412.00	20.44	30.00	-9.56
		2442.00	20.23	30.00	-9.77
		2472.00	19.52	30.00	-10.48

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Data rate: 1 Mbps

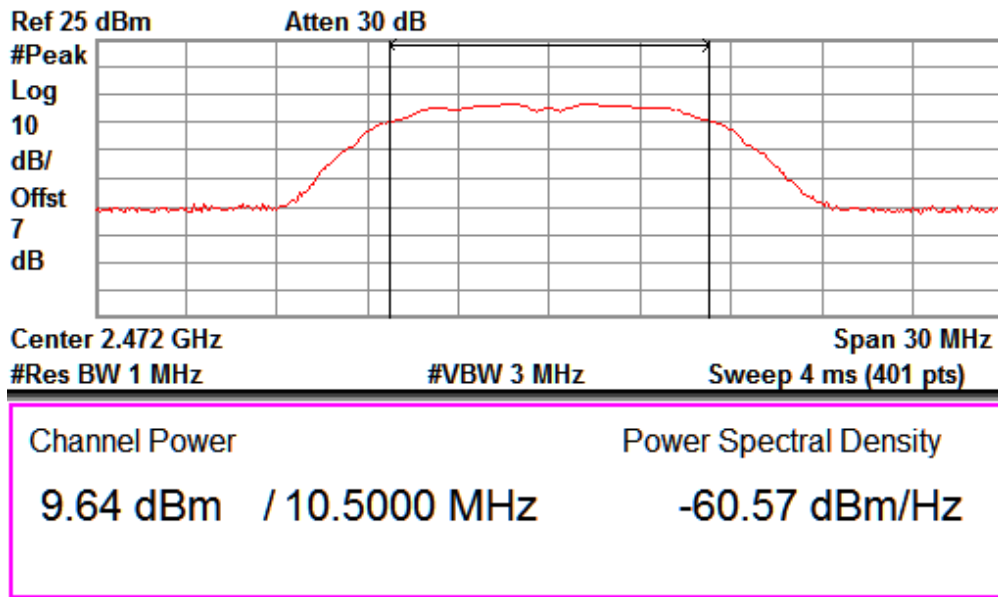
Channel Frequency: 2412 MHz



Data rate: 1 Mbps

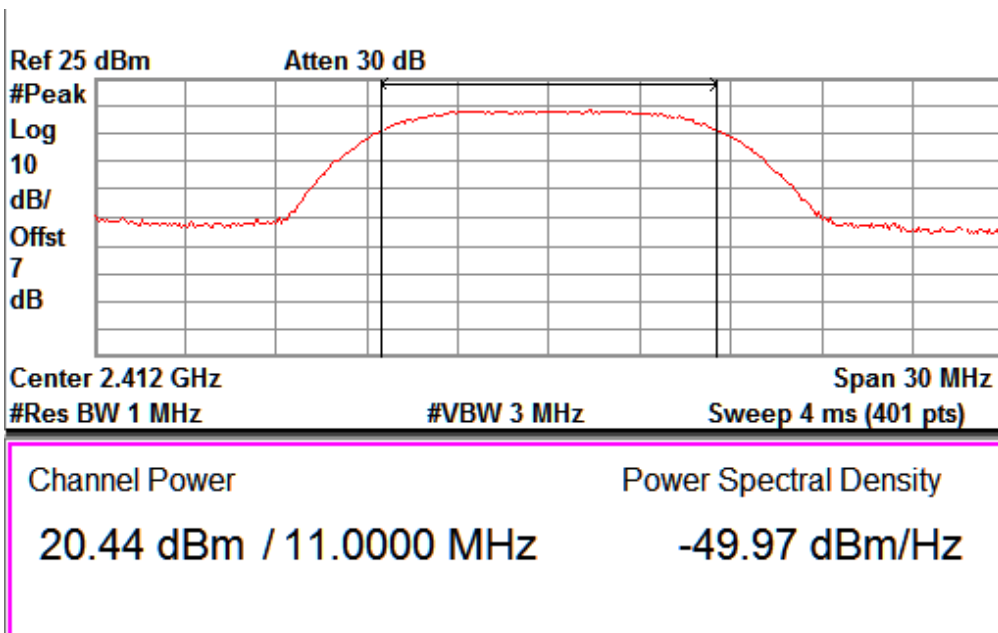
Channel Frequency: 2442 MHz

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Data rate: 1 Mbps

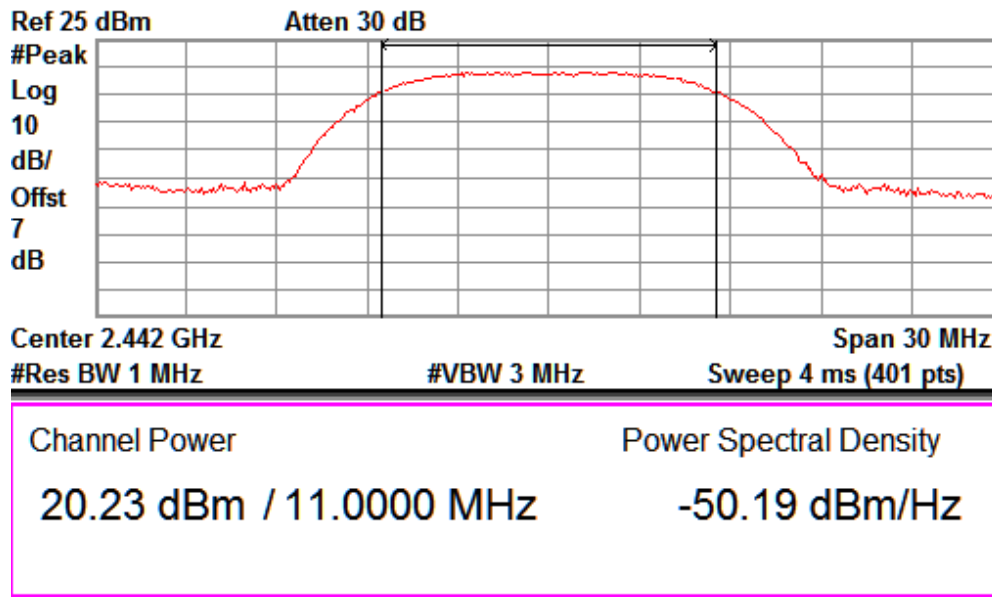
Channel Frequency: 2472 MHz



Data rate: 11 Mbps

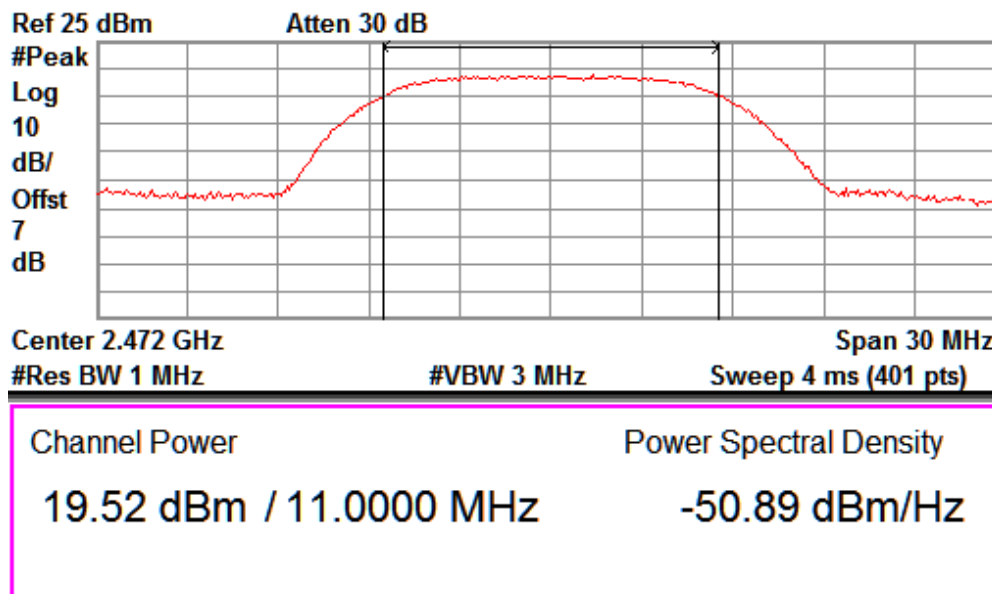
Channel Frequency: 2412 MHz

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Data rate: 11 Mbps

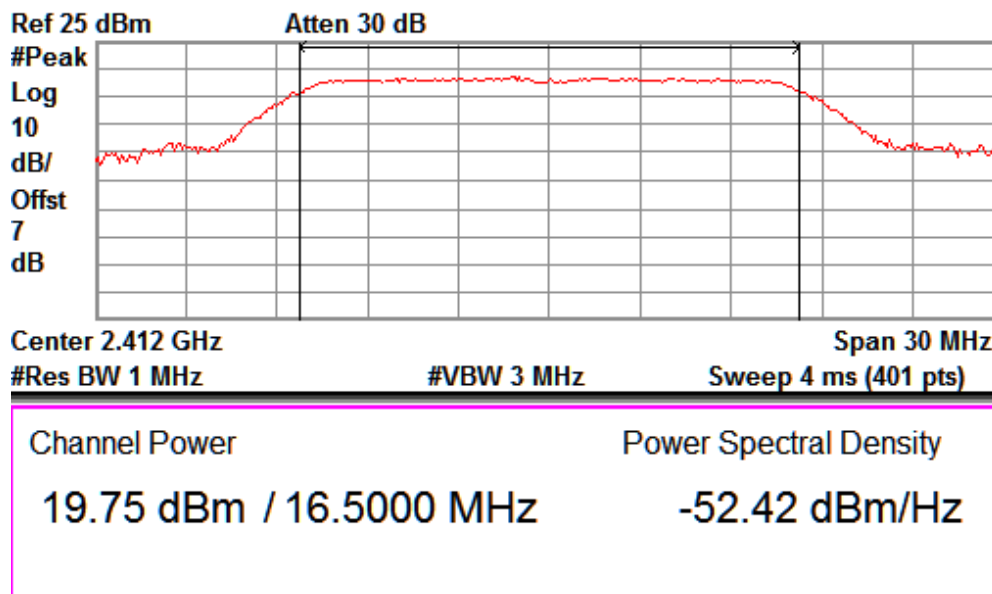
Channel Frequency: 2442 MHz



Data rate: 11 Mbps

Channel Frequency: 2472 MHz

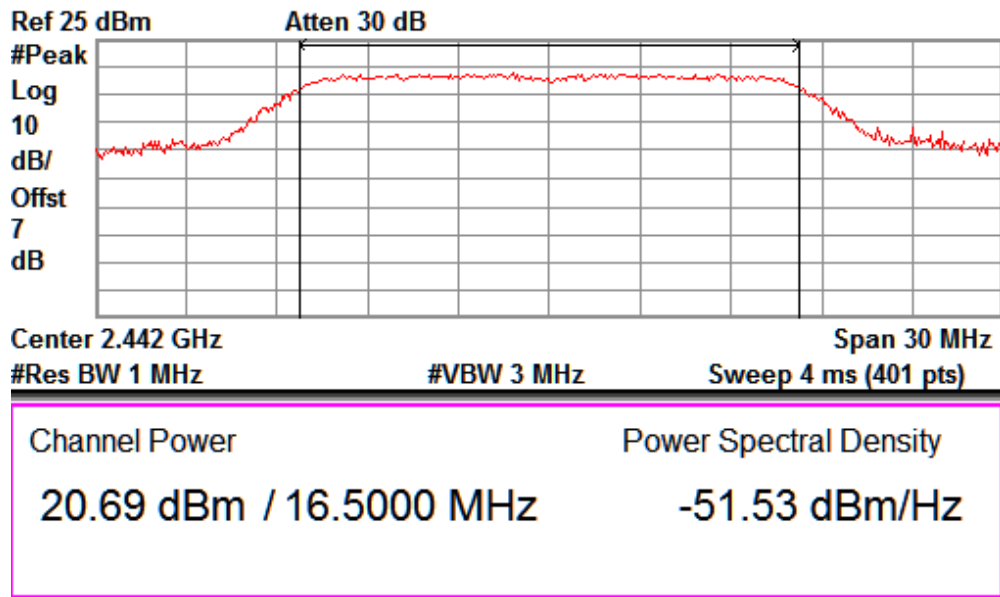
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total Power (dBm)	Limit (dBm)	Margin (dB)
g	6	2412.00	19.75	30.00	-10.25
		2442.00	20.69	30.00	-9.31
		2472.00	16.67	30.00	-13.33
	24	2412.00	20.01	30.00	-9.99
		2442.00	20.75	30.00	-9.25
		2472.00	16.80	30.00	-13.20
	54	2412.00	20.19	30.00	-9.81
		2442.00	19.92	30.00	-10.08
		2472.00	17.00	30.00	-13.00



Data rate: 6 Mbps

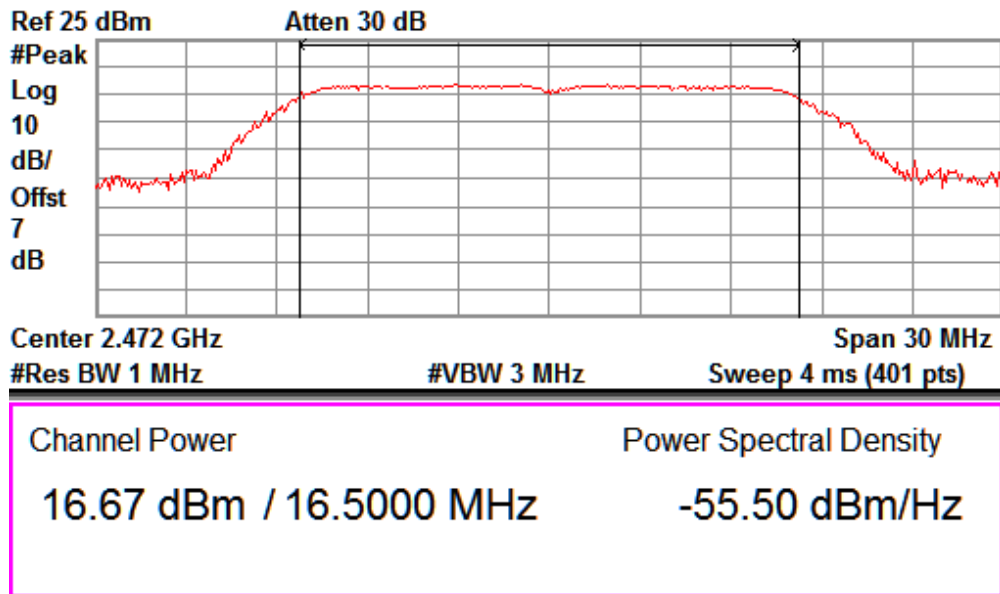
Channel Frequency: 2412 MHz

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Data rate: 6 Mbps

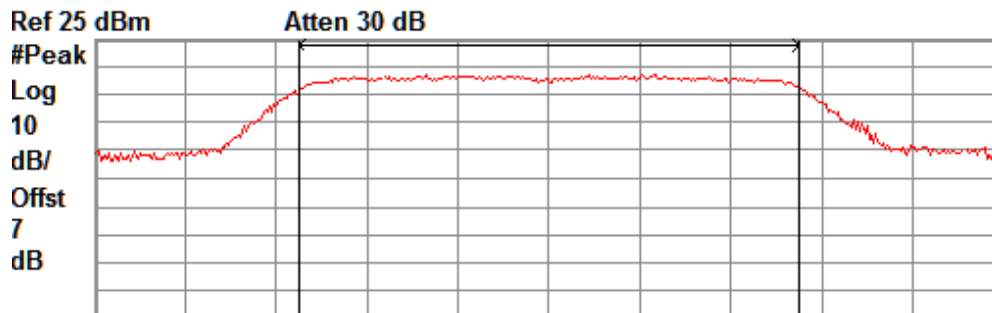
Channel Frequency: 2442 MHz



Data rate: 6 Mbps

Channel Frequency: 2472 MHz

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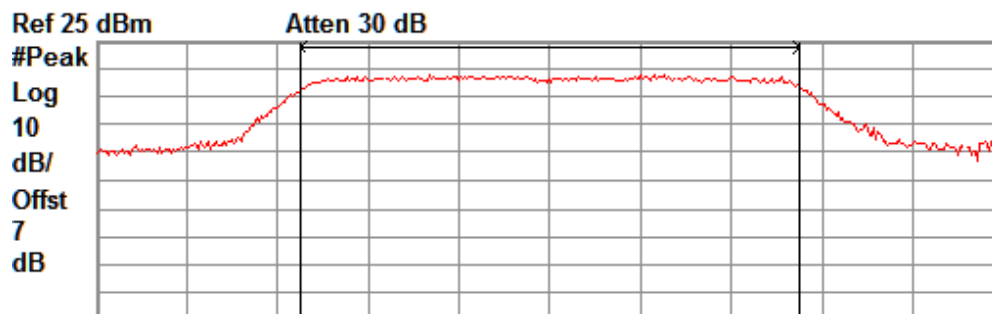


Center 2.412 GHz Span 30 MHz
 #Res BW 1 MHz #VBW 3 MHz Sweep 4 ms (401 pts)

Channel Power	Power Spectral Density
20.01 dBm / 16.5000 MHz	-52.16 dBm/Hz

Data rate: 24 Mbps

Channel Frequency: 2412 MHz



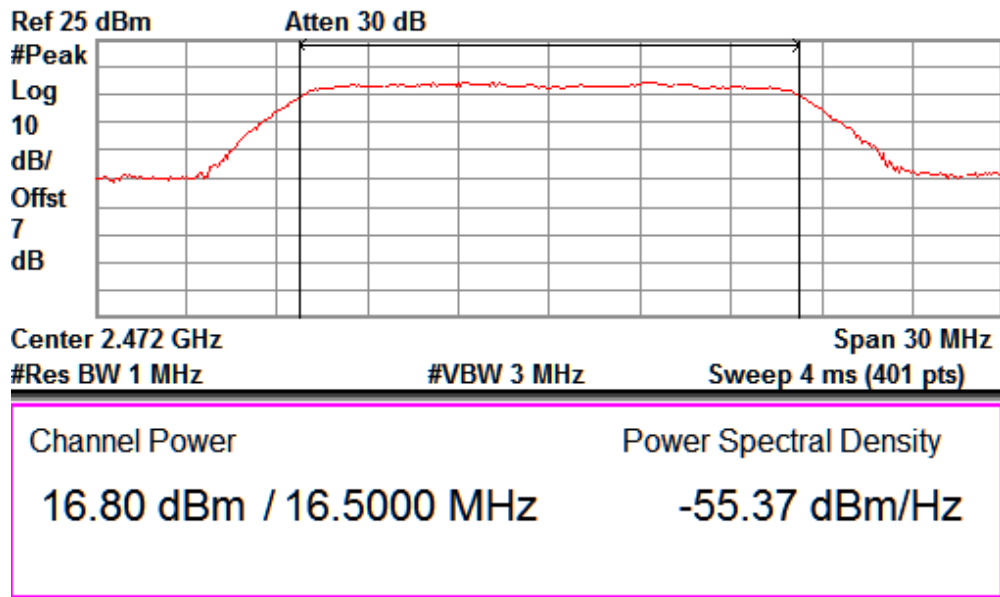
Center 2.442 GHz Span 30 MHz
 #Res BW 1 MHz #VBW 3 MHz Sweep 4 ms (401 pts)

Channel Power	Power Spectral Density
20.75 dBm / 16.5000 MHz	-51.42 dBm/Hz

Data rate: 24 Mbps

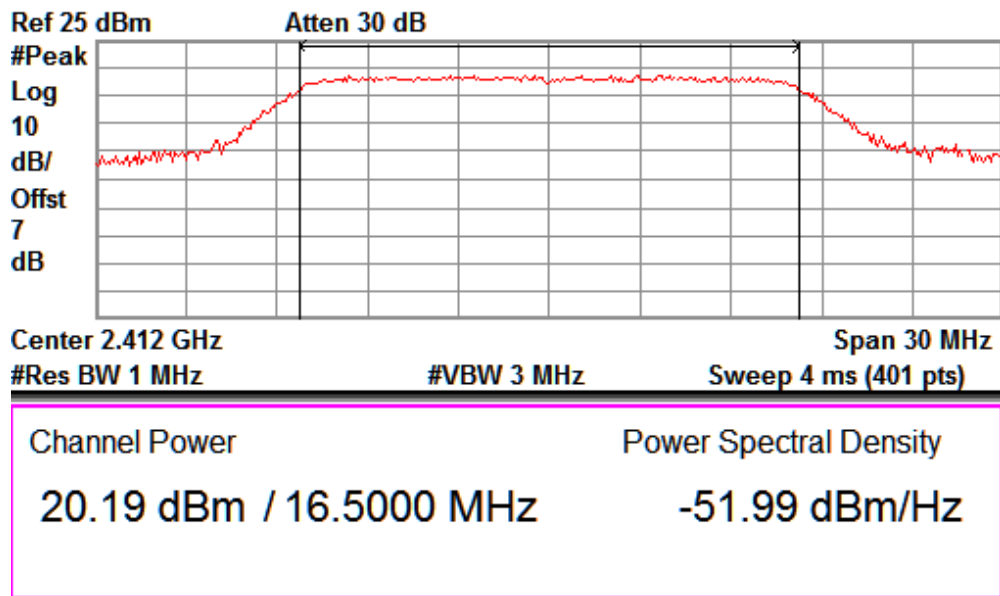
Channel Frequency: 2442 MHz

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Data rate: 24 Mbps

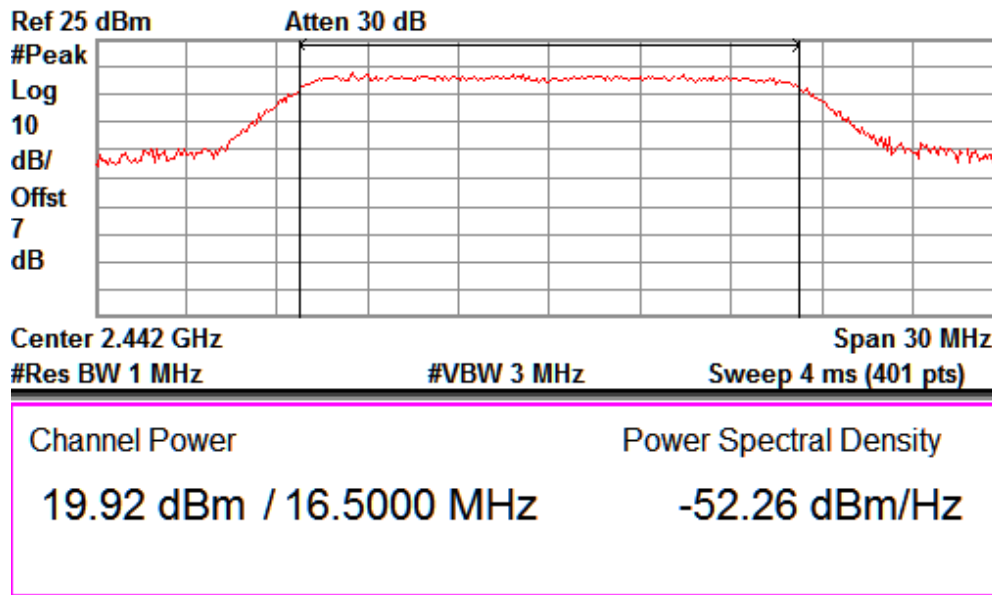
Channel Frequency: 2472 MHz



Data rate: 54 Mbps

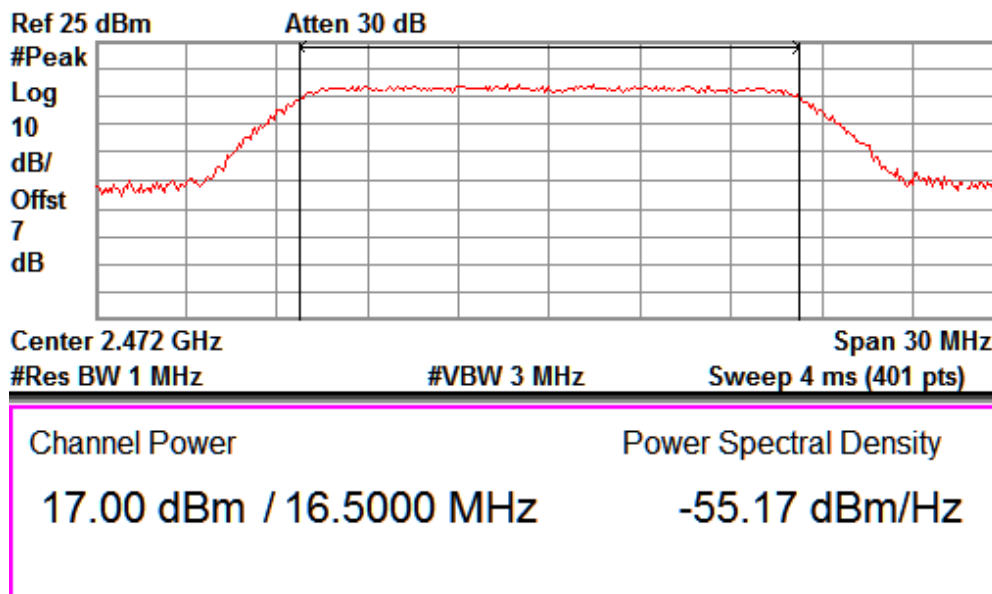
Channel Frequency: 2412 MHz

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Data rate: 54 Mbps

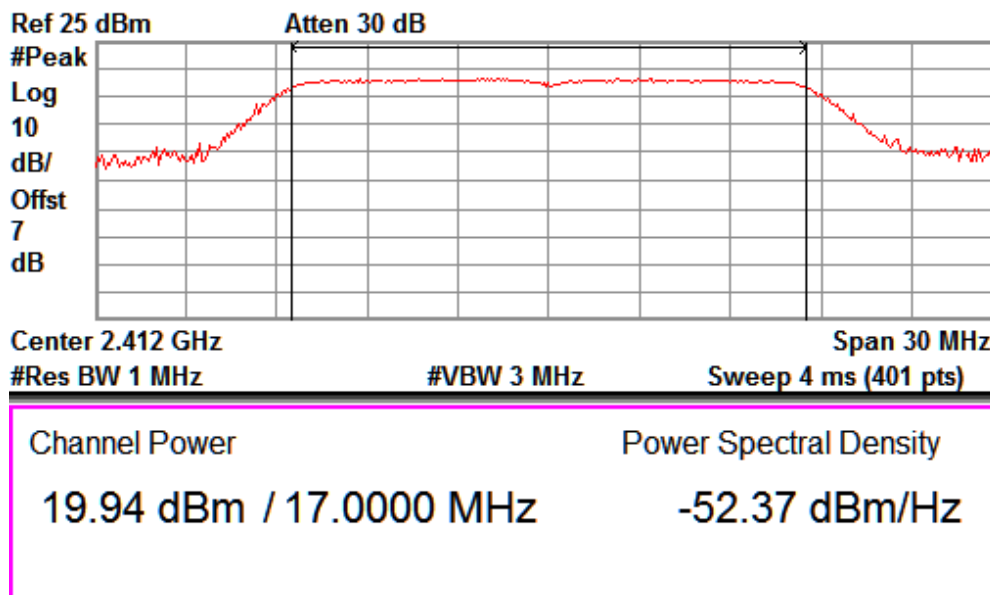
Channel Frequency: 2442 MHz



Data rate: 54 Mbps

Channel Frequency: 2472 MHz

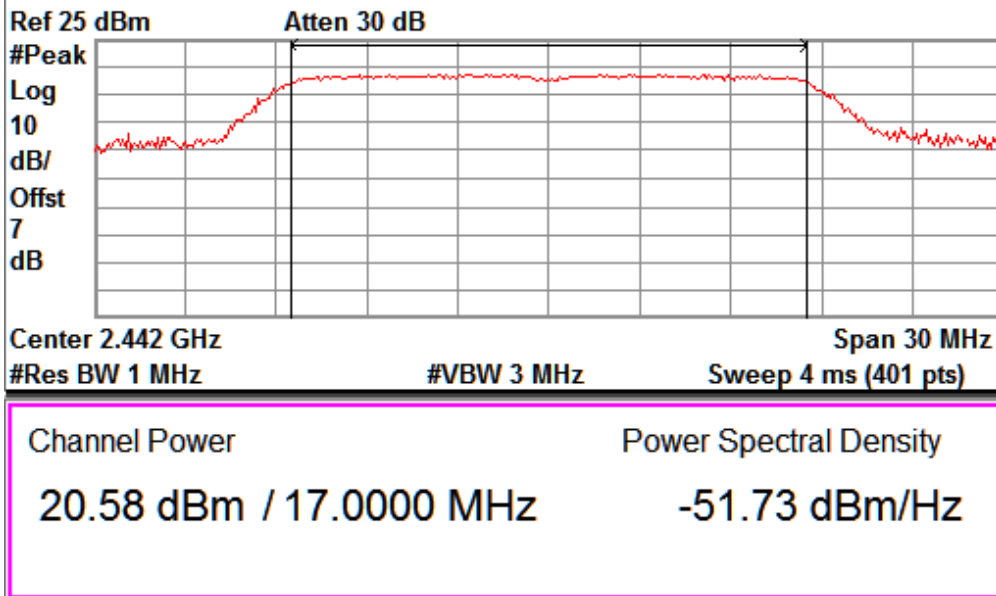
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total Power (dBm)	Limit (dBm)	Margin (dB)
n	6.5	2412.00	19.94	30.00	-10.06
		2442.00	20.58	30.00	-9.42
		2472.00	15.91	30.00	-14.09
	39	2412.00	20.06	30.00	-9.94
		2442.00	20.96	30.00	-9.04
		2472.00	16.01	30.00	-13.99
	65	2412.00	20.26	30.00	-9.74
		2442.00	20.09	30.00	-9.91
		2472.00	16.05	30.00	-13.95



Data Rate: 6.5 Mbps

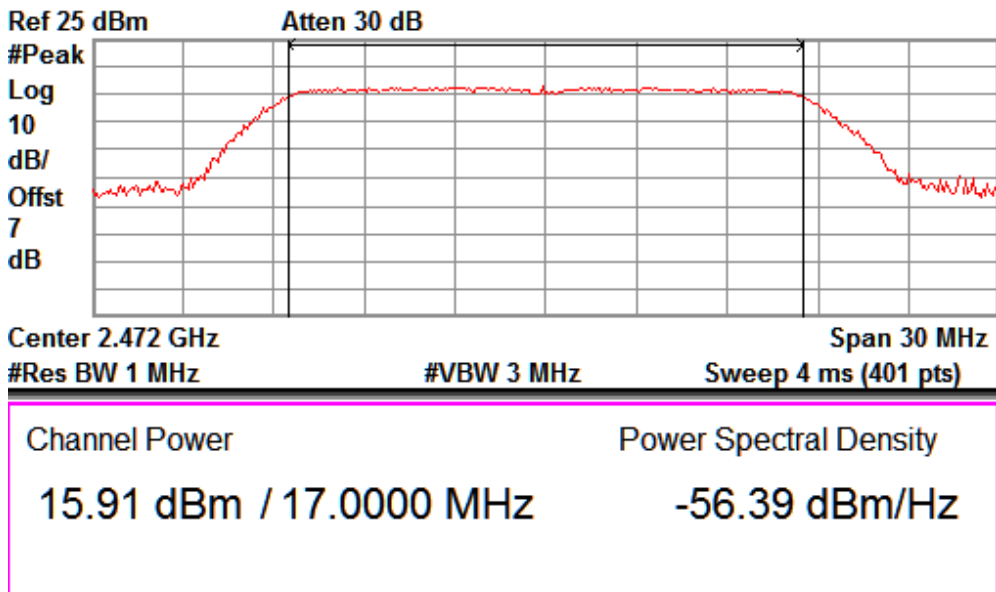
Channel Frequency: 2412 MHz

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Data Rate: 6.5 Mbps

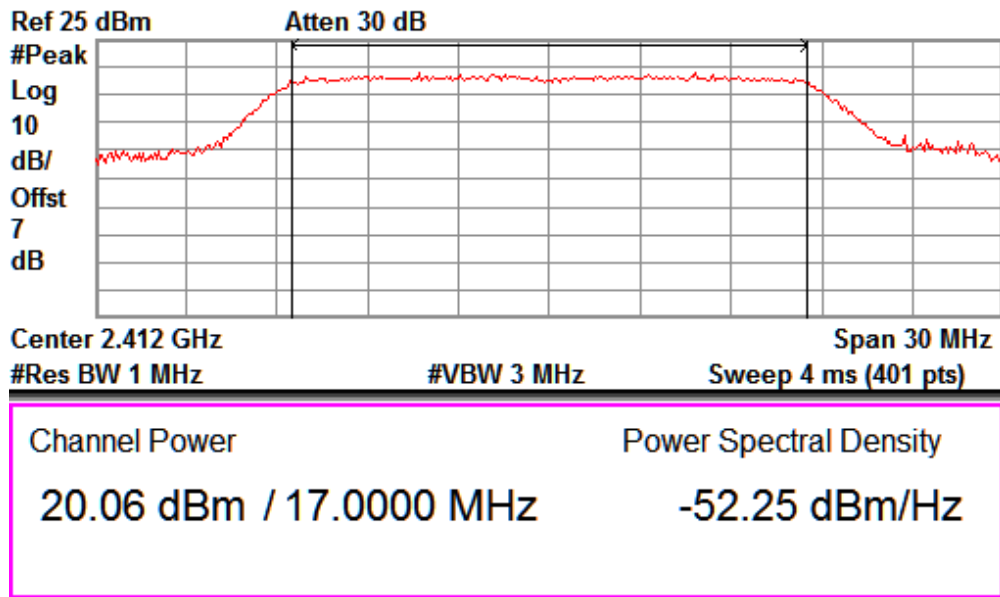
Channel Frequency: 2442 MHz



Data Rate: 6.5 Mbps

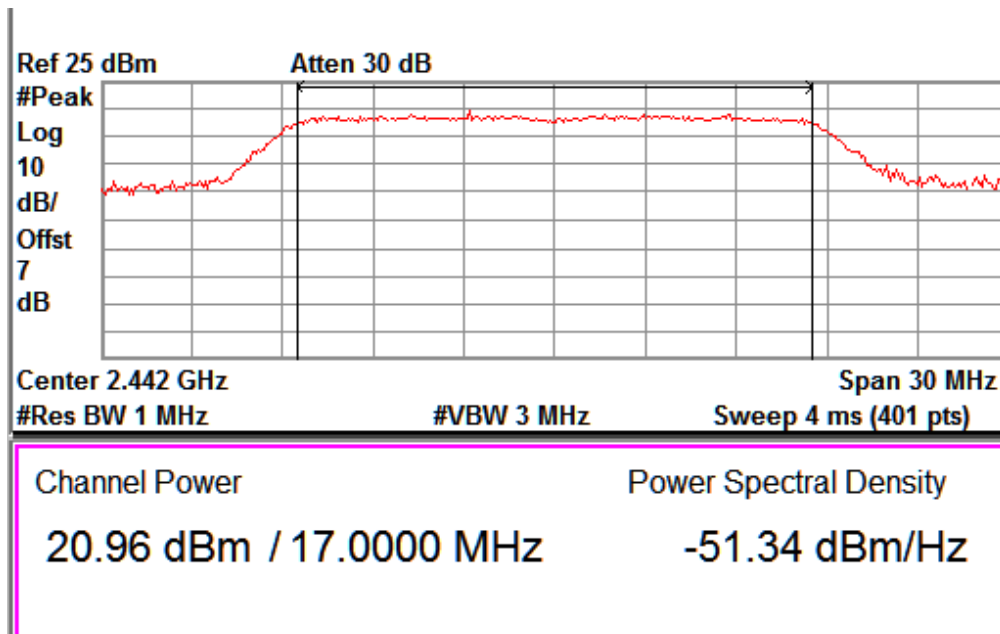
Channel Frequency: 2472 MHz

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Data Rate: 39 Mbps

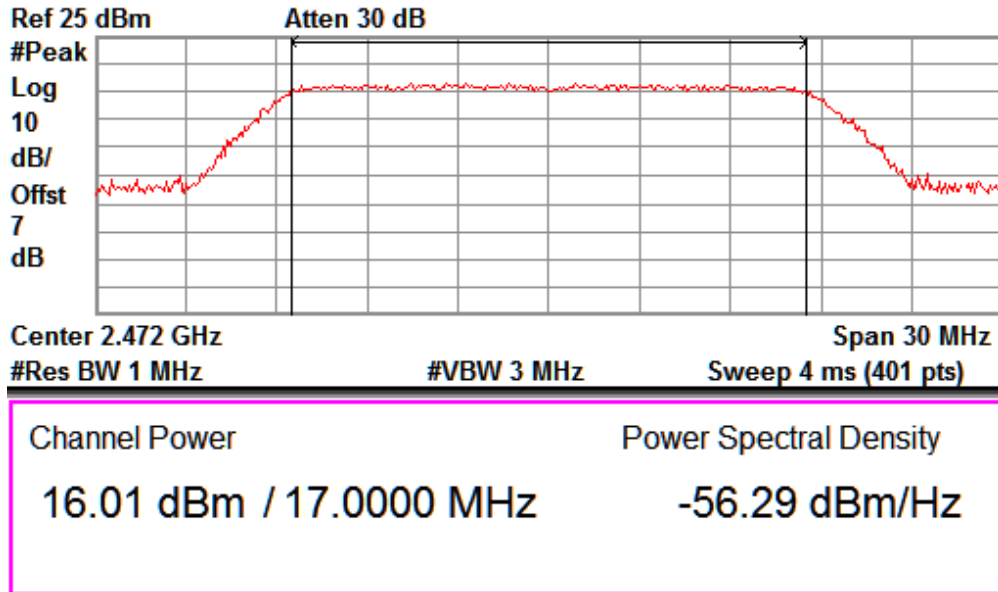
Channel Frequency: 2412 MHz



Data Rate: 39 Mbps

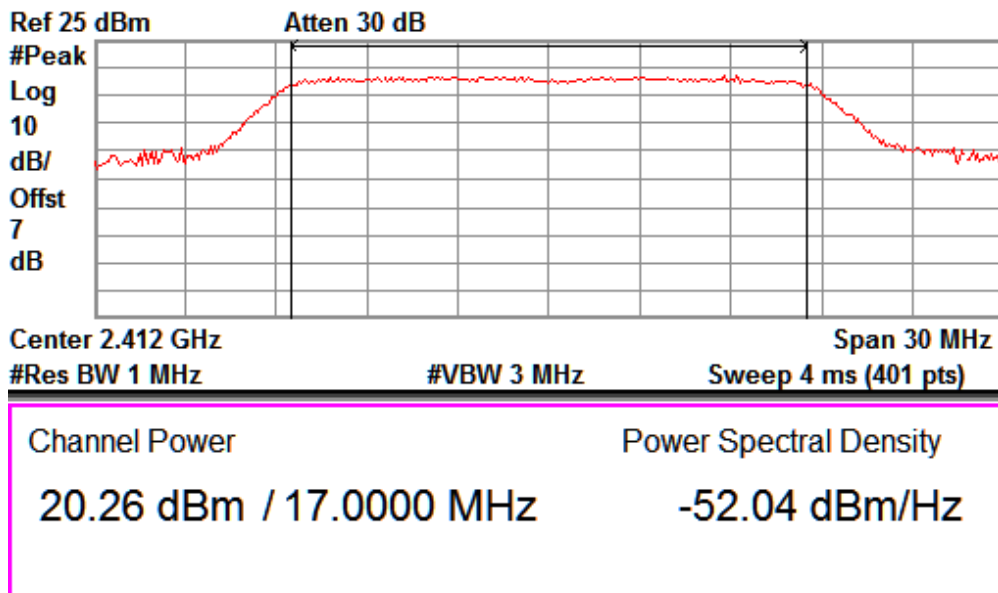
Channel Frequency: 2442 MHz

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Data Rate: 39 Mbps

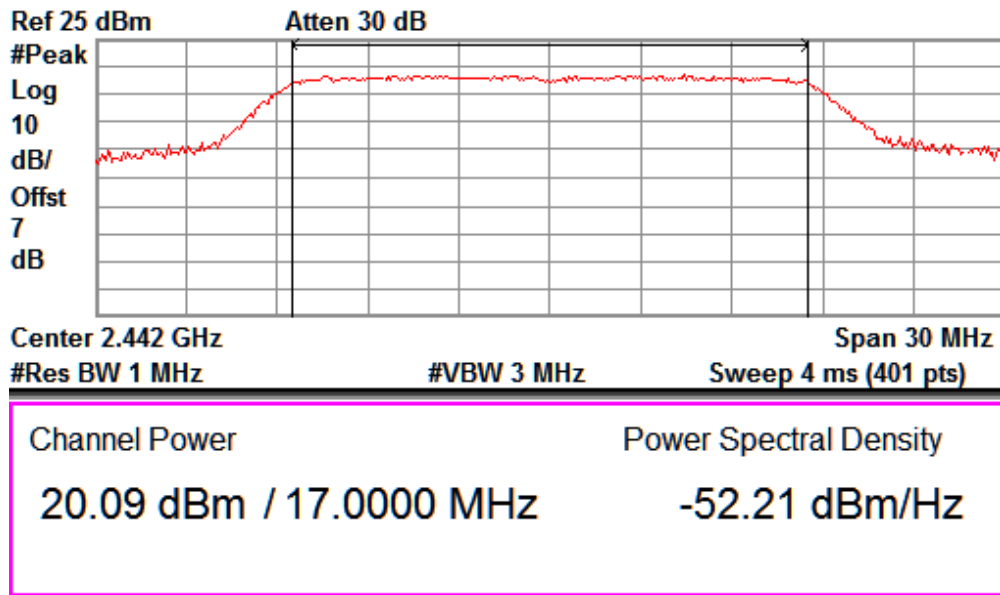
Channel Frequency: 2472 MHz



Data Rate: 65 Mbps

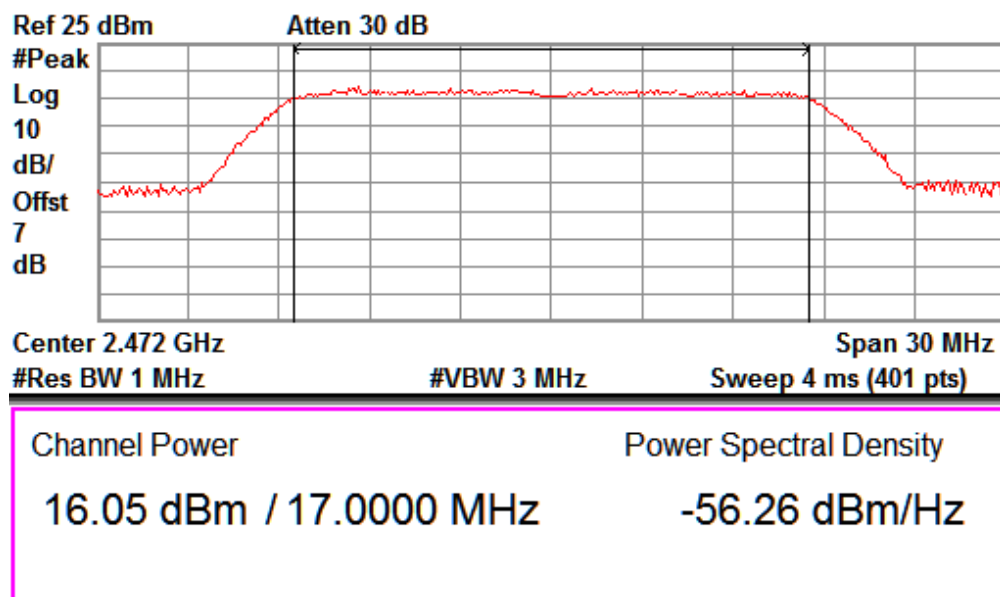
Channel Frequency: 2412 MHz

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Data Rate: 65 Mbps

Channel Frequency: 2442 MHz



Data Rate: 65 Mbps

Channel Frequency: 2472 MHz

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Maximum Power Spectral Density

Section 15.247(e)

Result

Pass

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

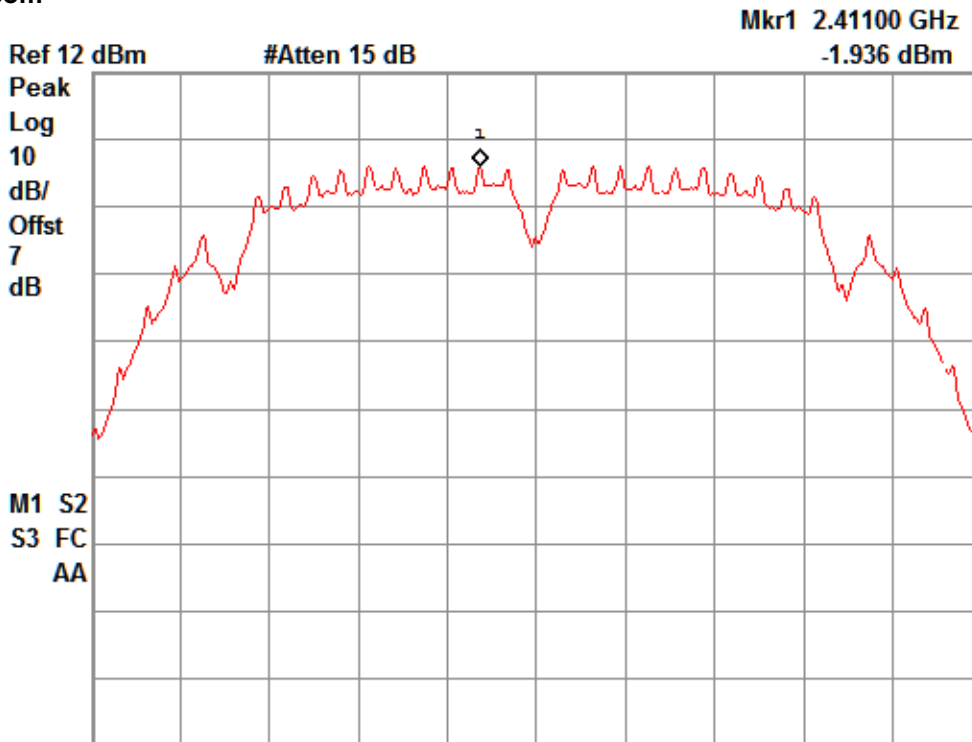
Test Method:



Test Result:

802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
b	1	2412.00	-1.93	8.00	-9.93
		2442.00	-2.01	8.00	-10.01
		2472.00	-2.61	8.00	-10.61
	11	2412.00	6.76	8.00	-1.24
		2442.00	6.16	8.00	-1.84
		2472.00	6.03	8.00	-1.97

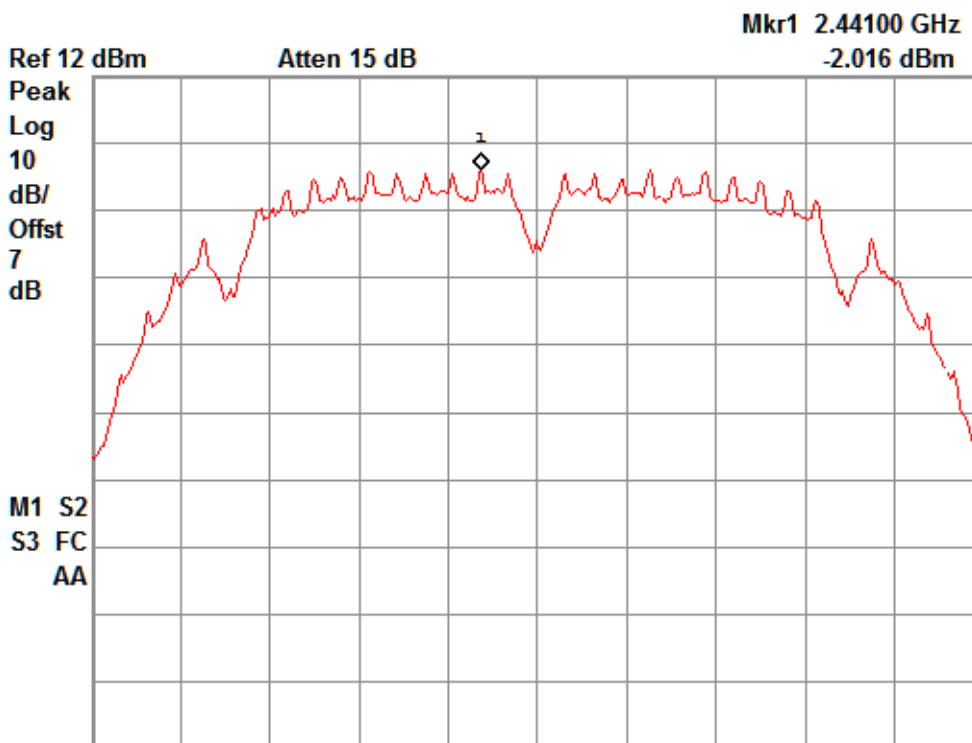
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Center 2.412 GHz Span 16 MHz
Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)

Data rate: 1 Mbps

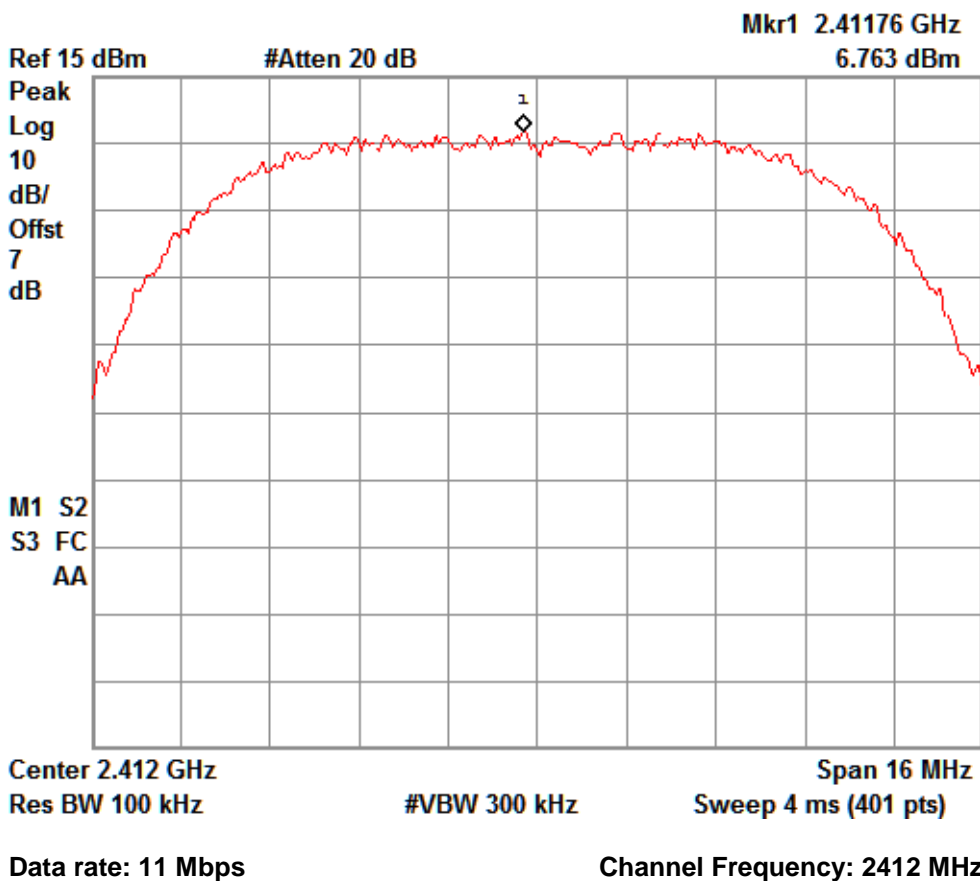
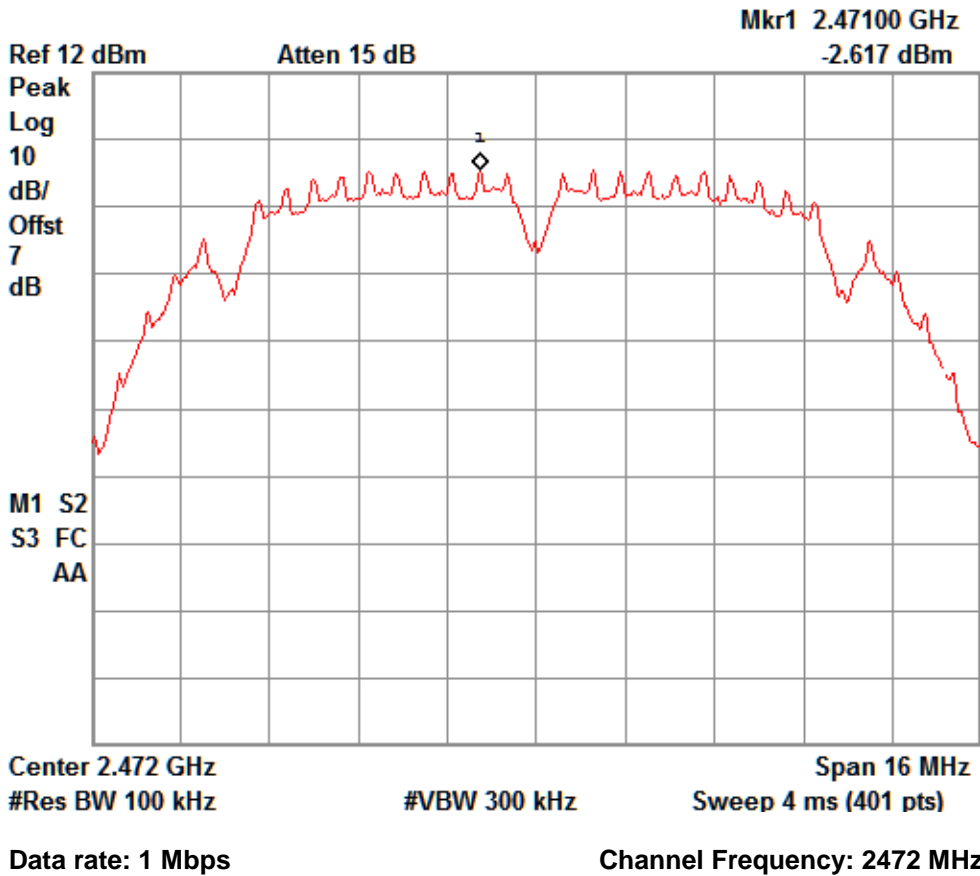
Channel Frequency: 2412 MHz



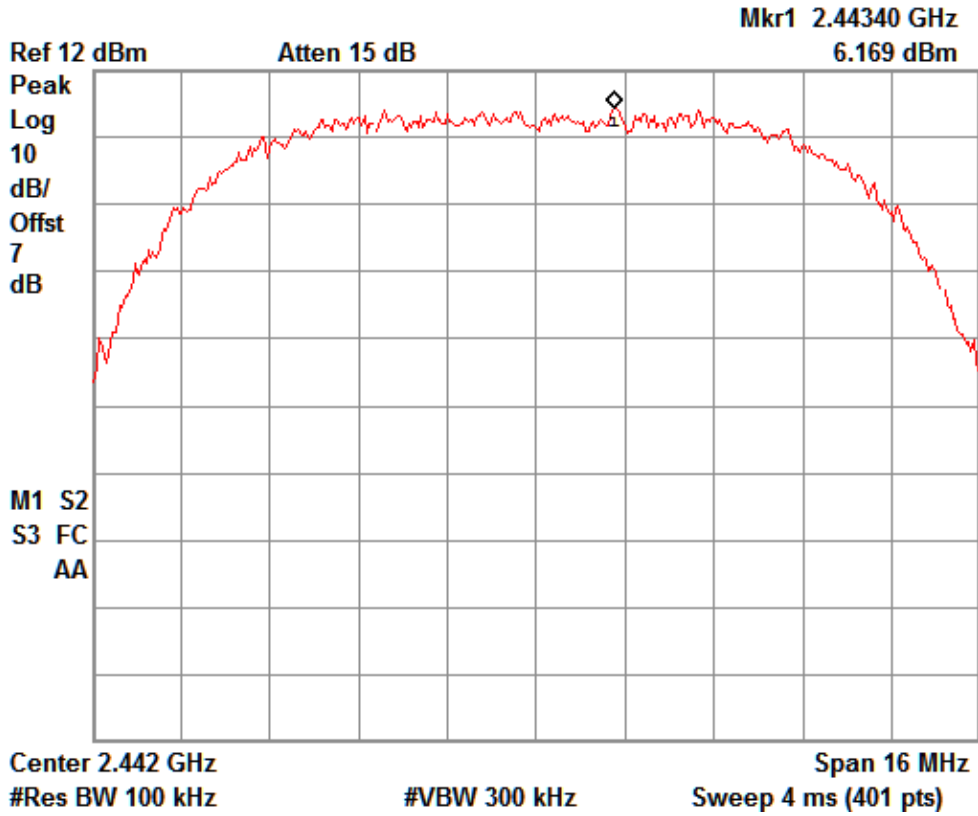
Center 2.442 GHz Span 16 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)

Data rate: 1 Mbps

Channel Frequency: 2442 MHz

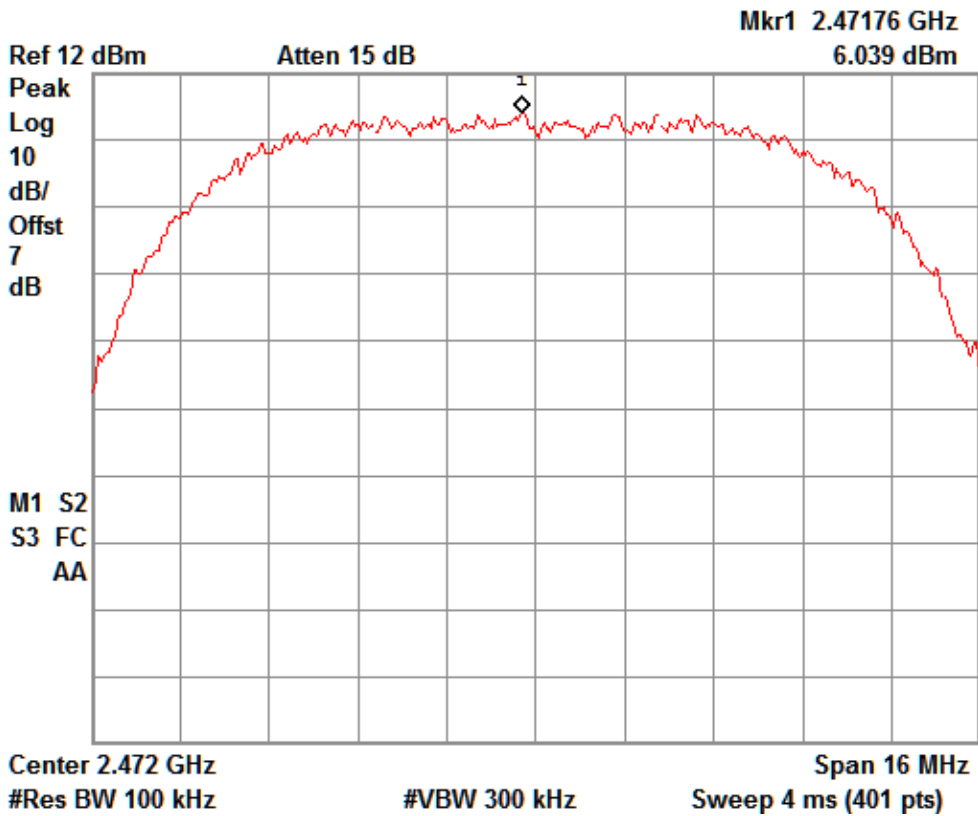


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Data rate: 11 Mbps

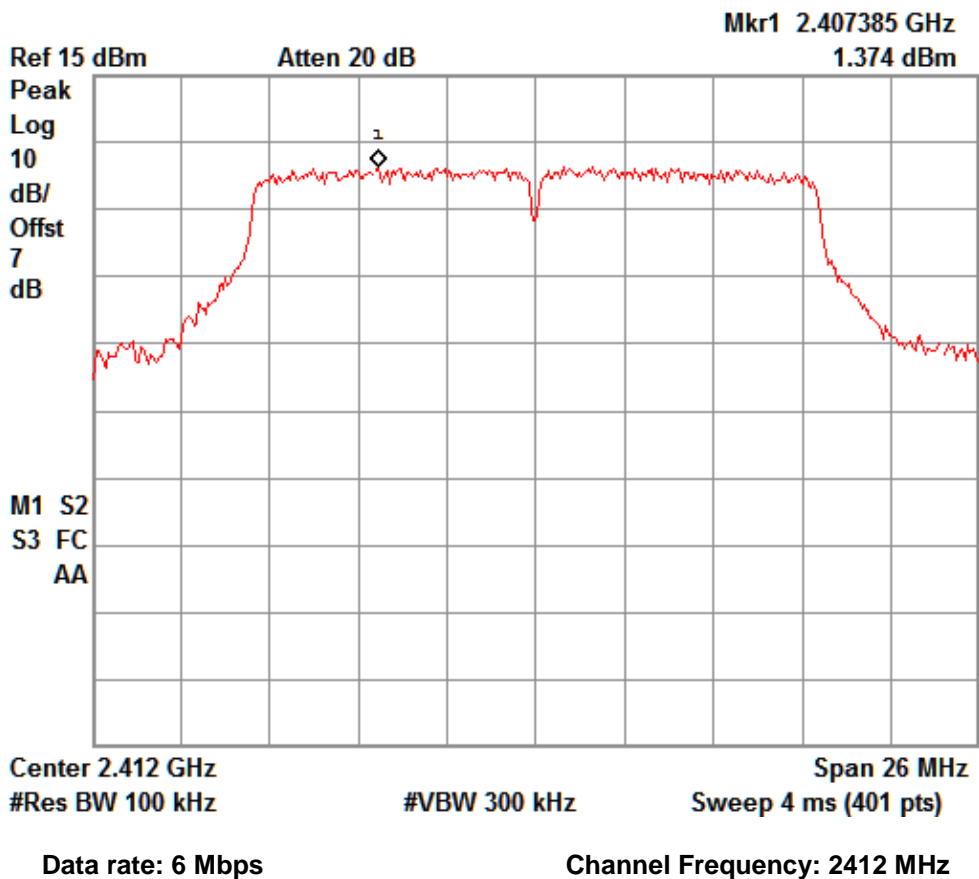
Channel Frequency: 2442 MHz



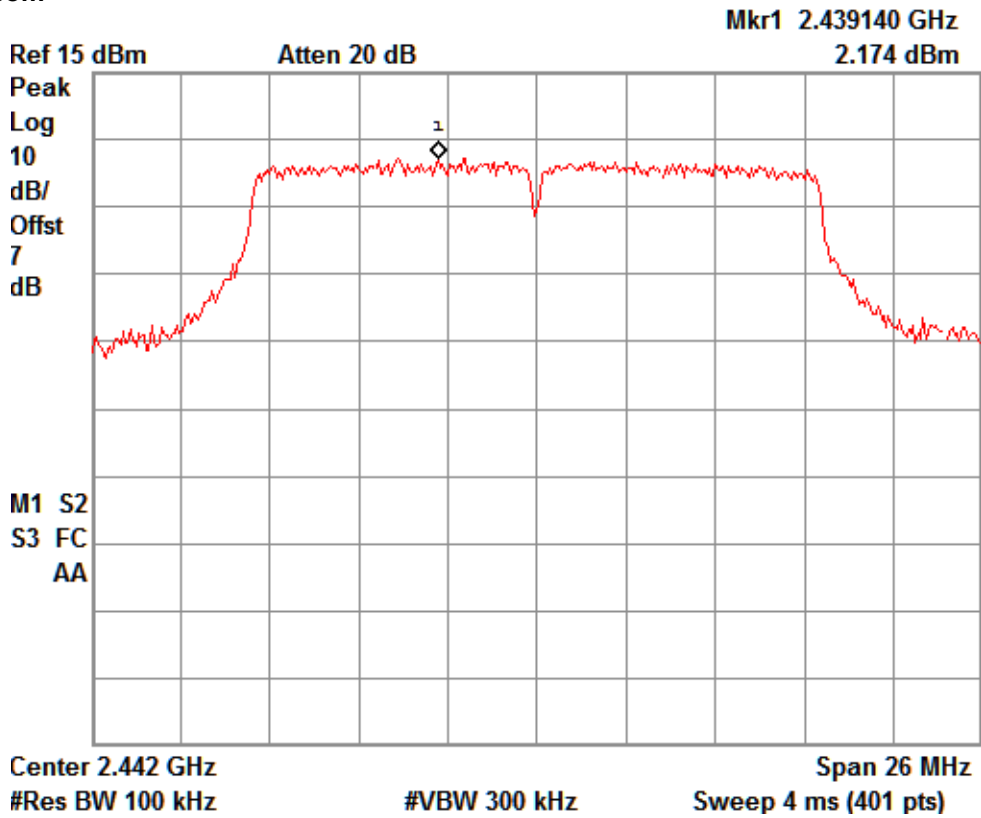
Data rate: 11 Mbps

Channel Frequency: 2472 MHz

802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
g	6	2412.00	1.37	8.00	-6.63
		2442.00	2.17	8.00	-5.83
		2472.00	-1.54	8.00	-9.54
	24	2412.00	2.56	8.00	-5.44
		2442.00	3.26	8.00	-4.74
		2472.00	-0.65	8.00	-8.65
	54	2412.00	2.38	8.00	-5.62
		2442.00	2.93	8.00	-5.07
		2472.00	-0.28	8.00	-8.28

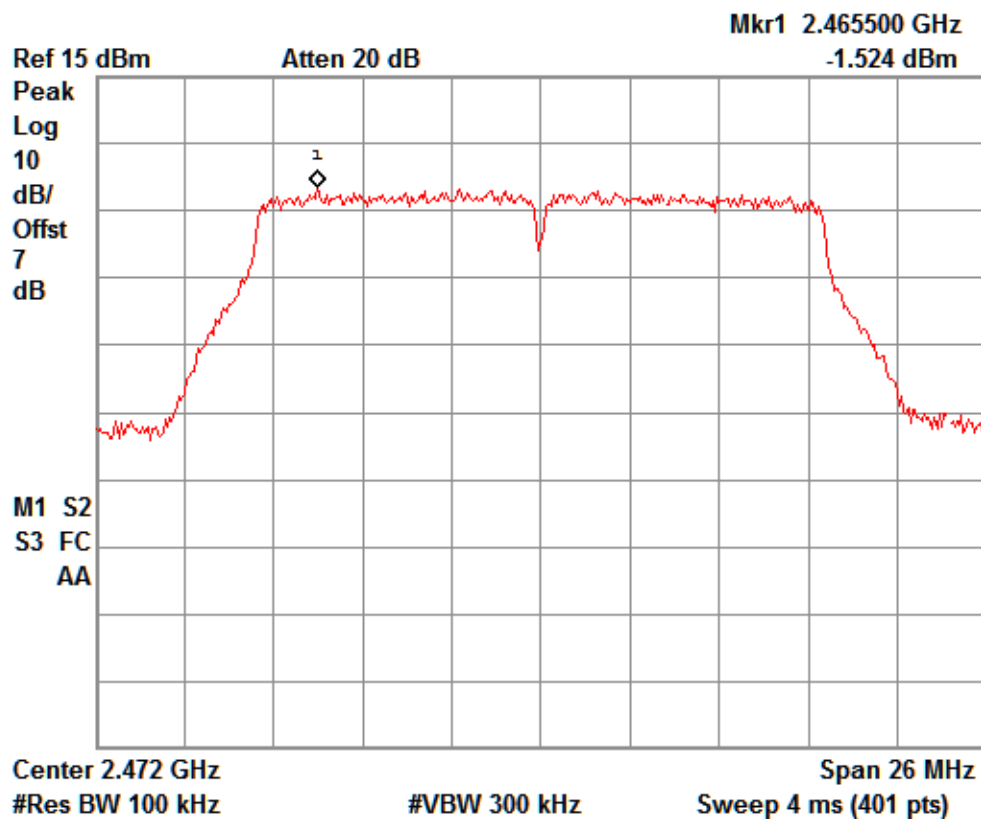


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Data rate: 6 Mbps

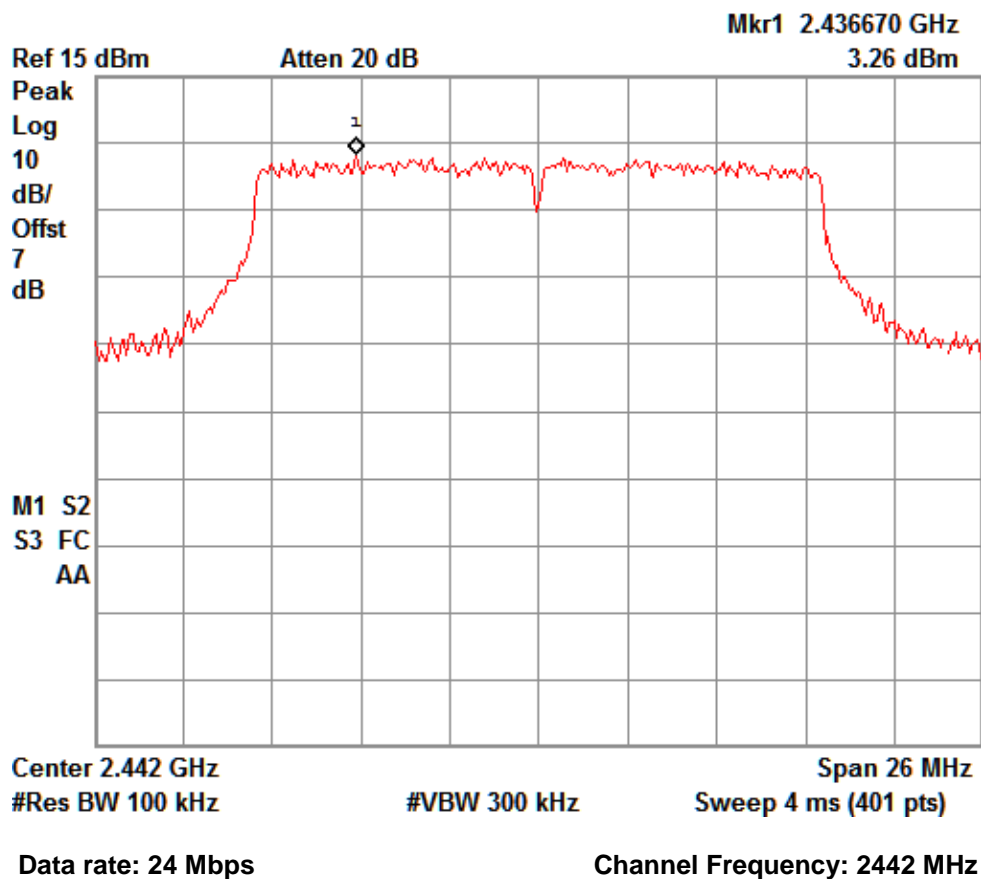
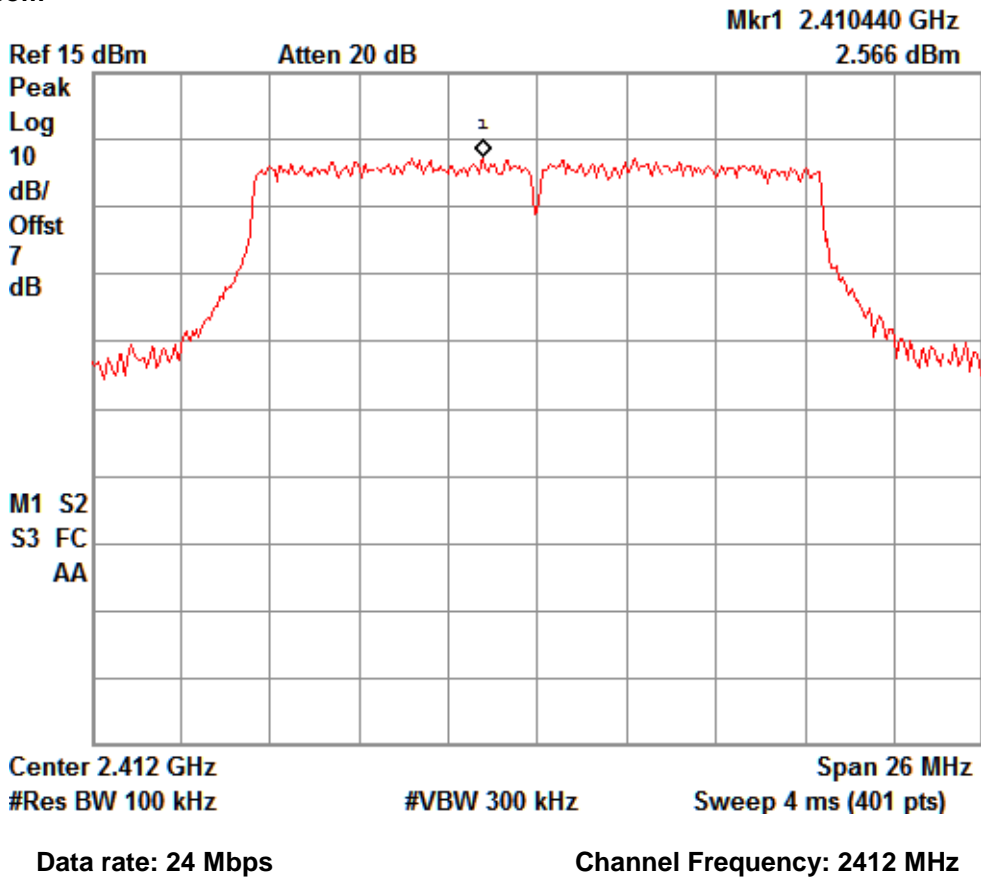
Channel Frequency: 2442 MHz



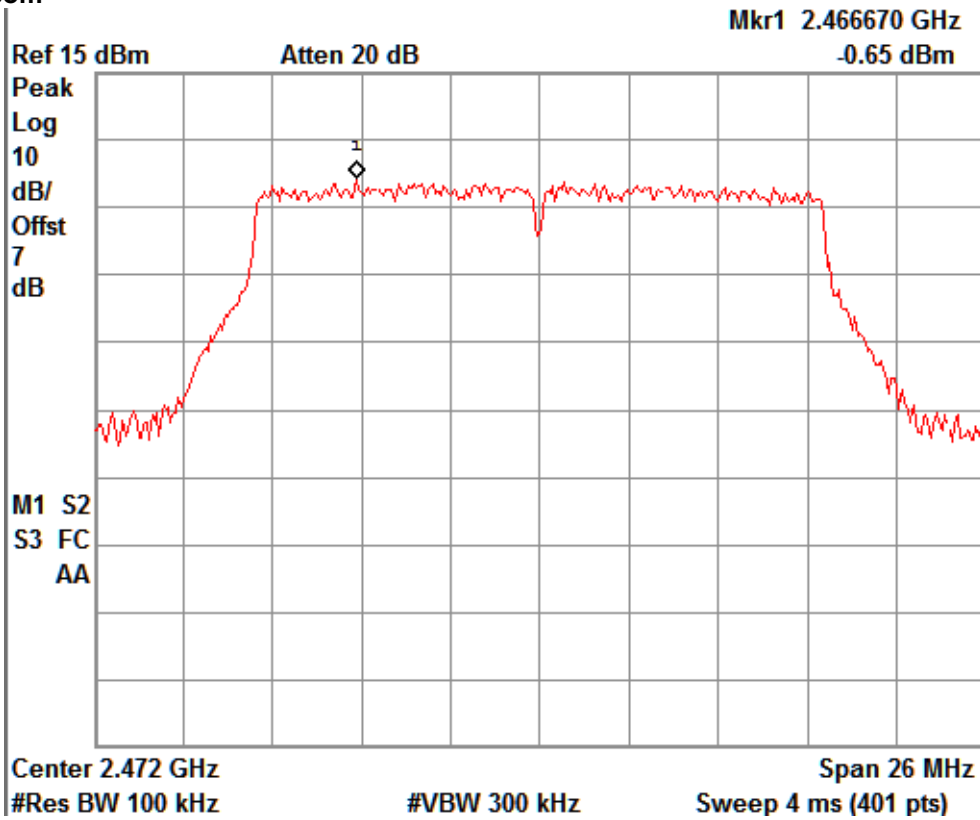
Data rate: 6 Mbps

Channel Frequency: 2472 MHz

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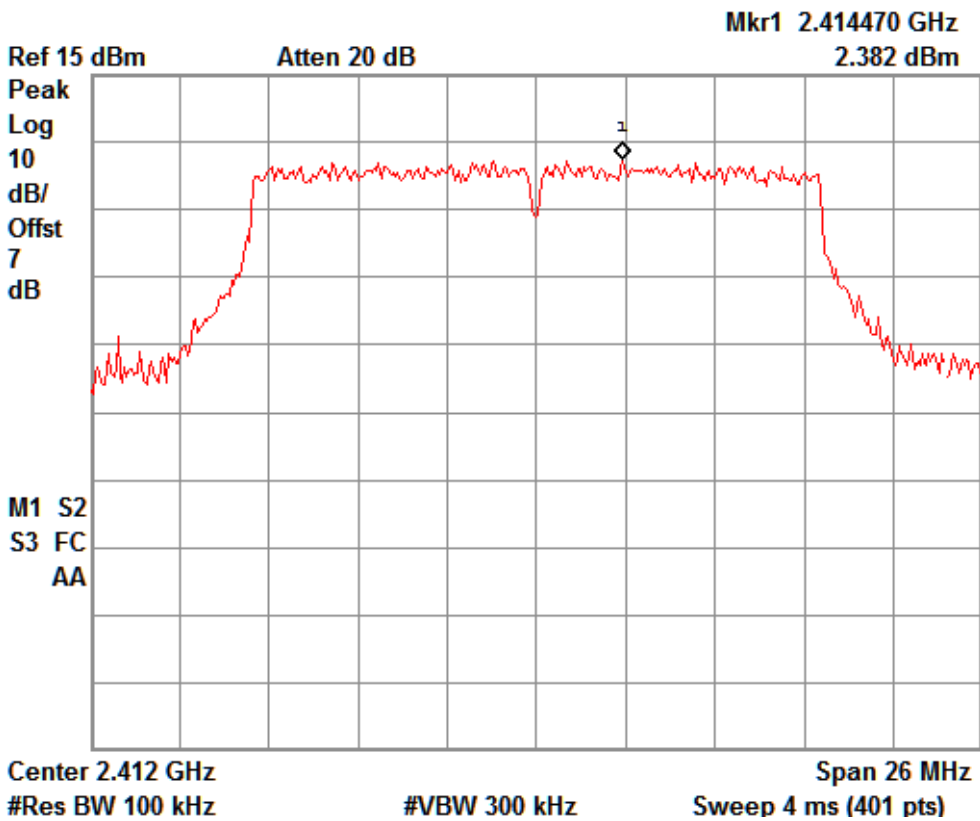


www.tuv.com



Data rate: 24 Mbps

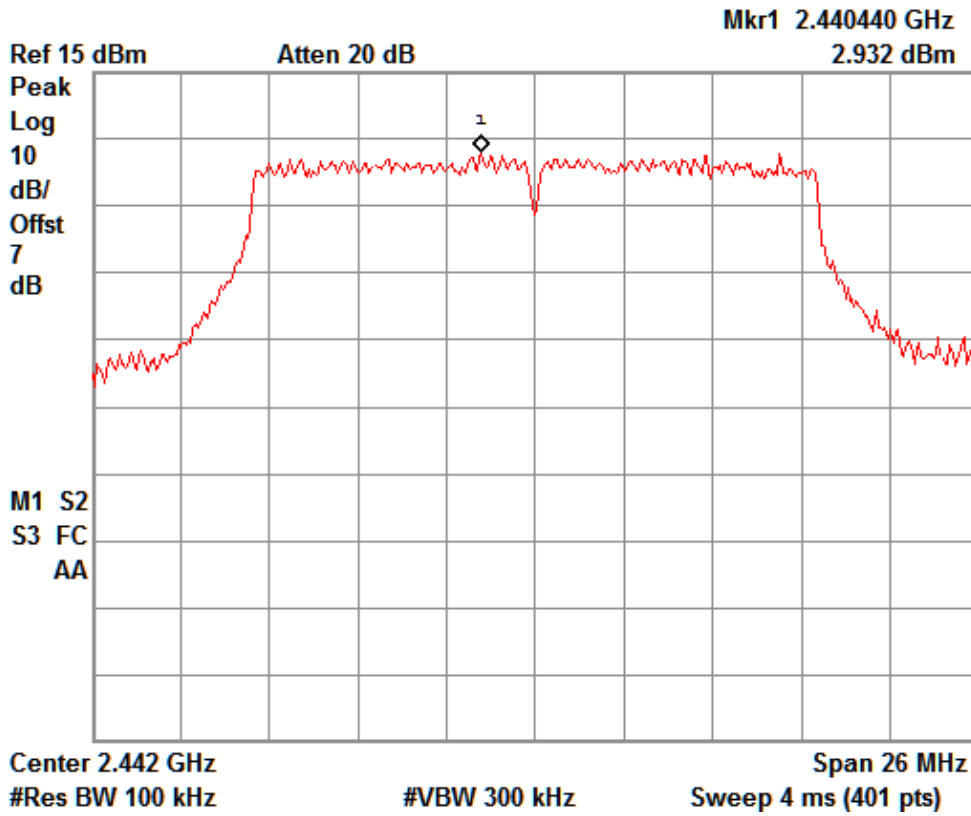
Channel Frequency: 2472 MHz



Data rate: 54 Mbps

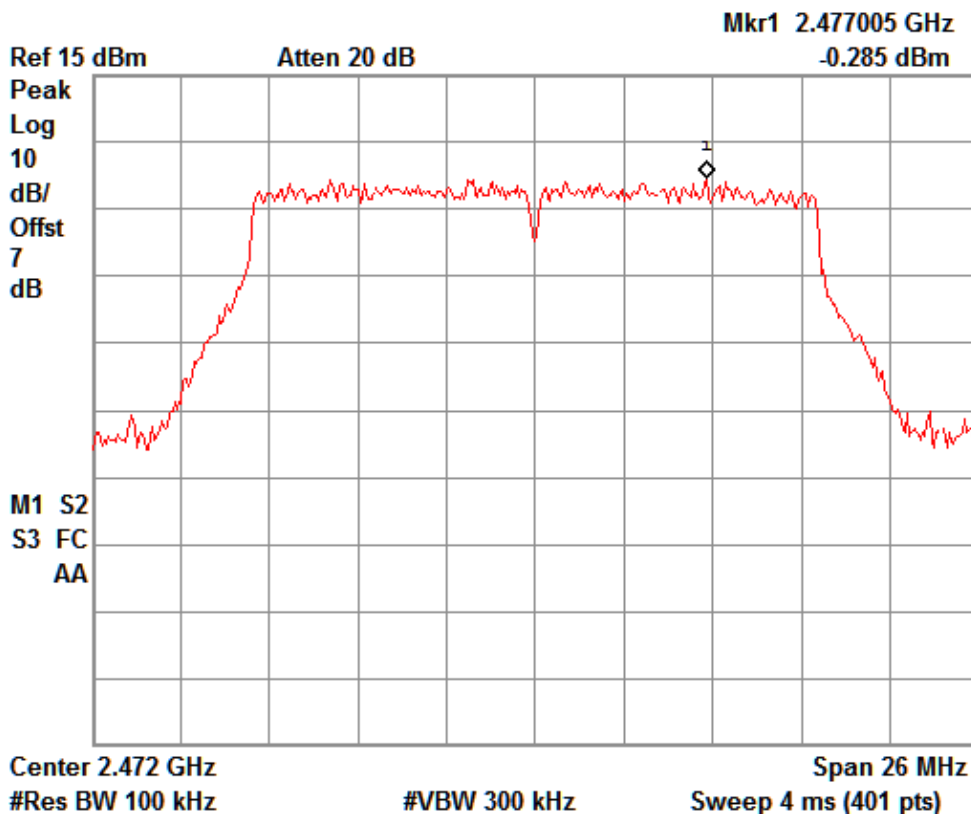
Channel Frequency: 2412 MHz

www.tuv.com



Data rate: 54 Mbps

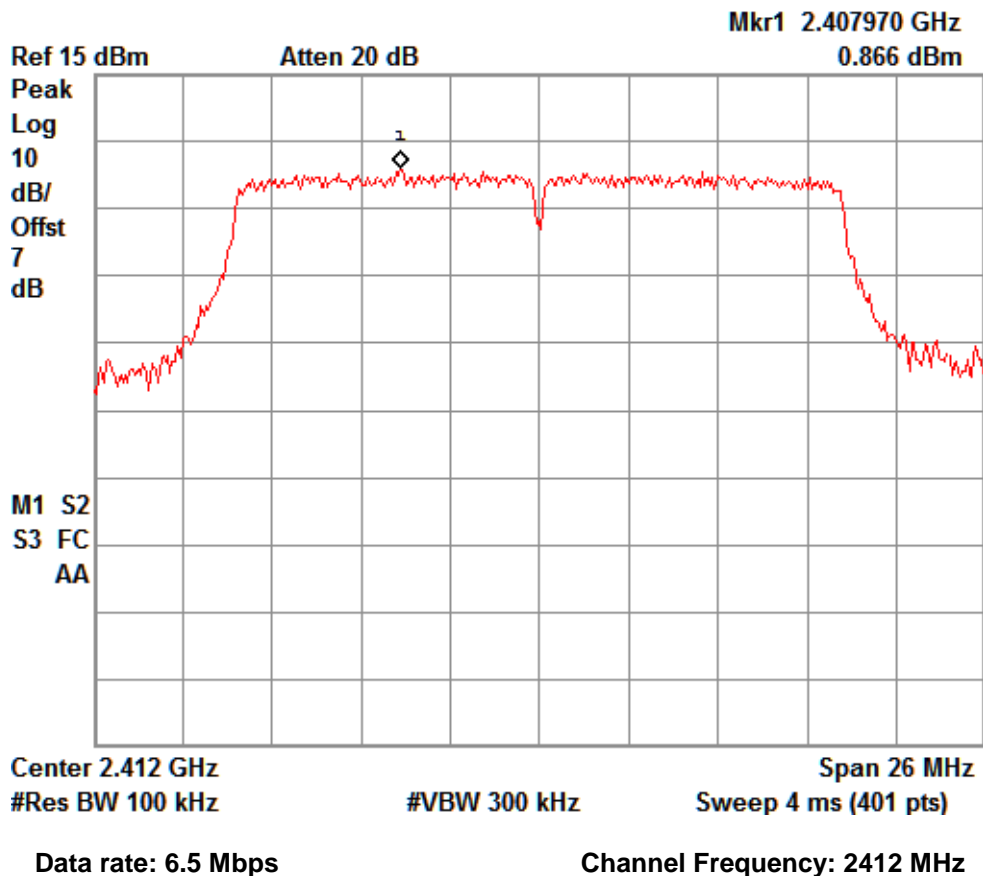
Channel Frequency: 2442 MHz



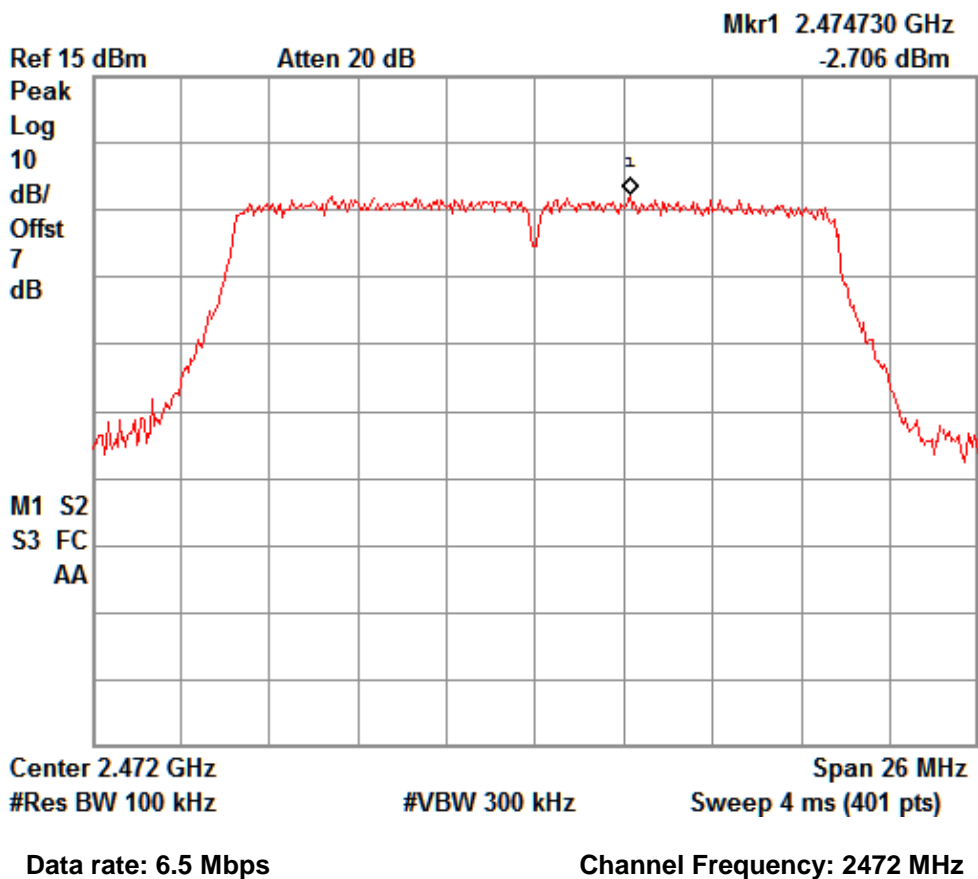
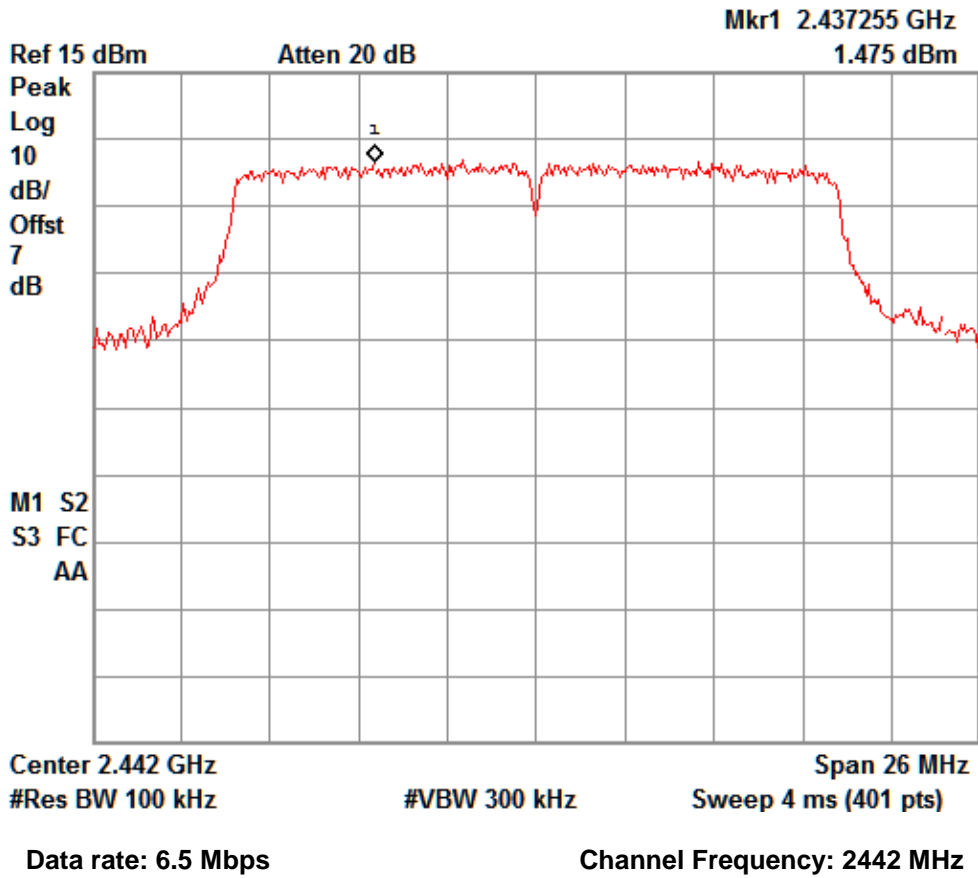
Data rate: 54 Mbps

Channel Frequency: 2472 MHz

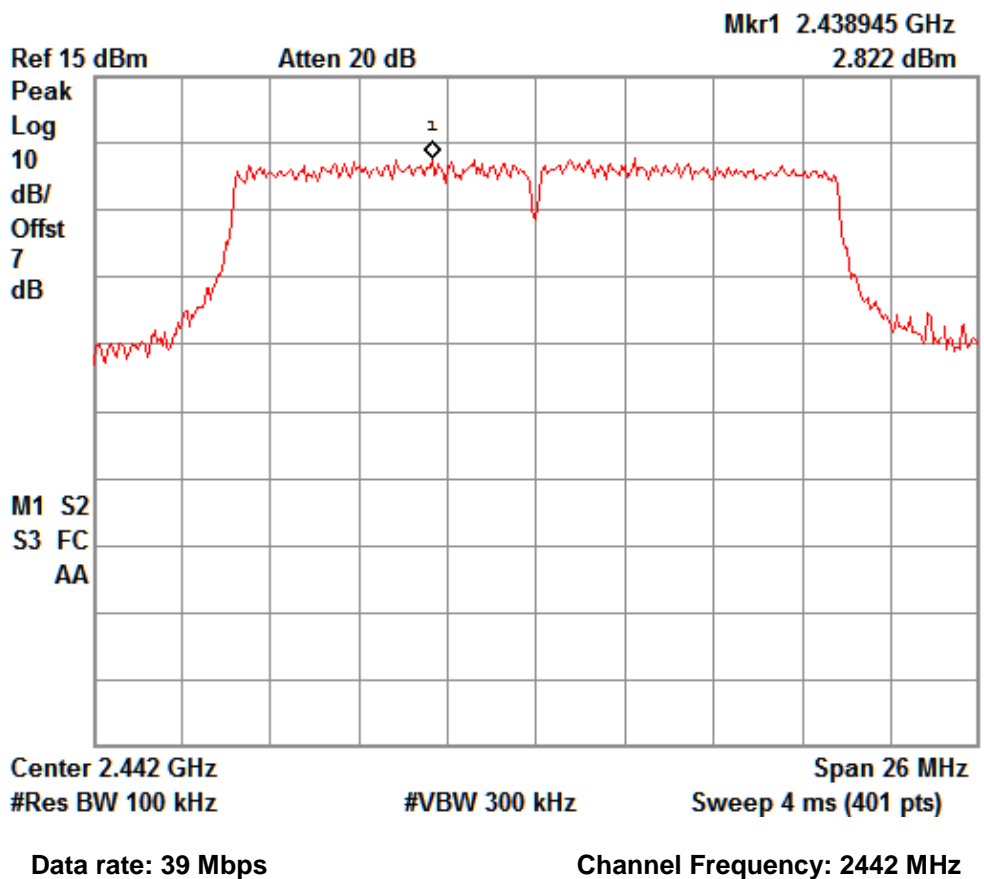
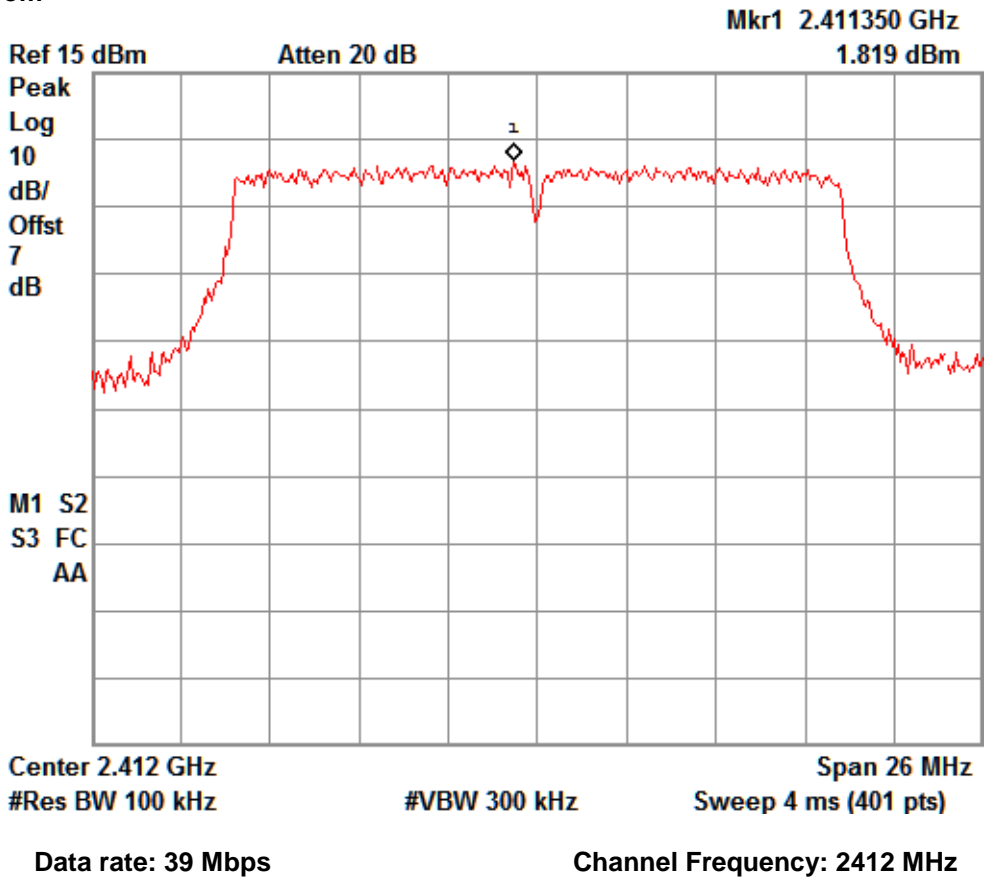
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
n	6.5	2412.00	0.86	8.00	-7.14
		2442.00	1.47	8.00	-6.53
		2472.00	-2.70	8.00	-10.70
	39	2412.00	1.81	8.00	-6.19
		2442.00	2.82	8.00	-5.18
		2472.00	-2.39	8.00	-10.39
	65	2412.00	2.35	8.00	-5.65
		2442.00	1.37	8.00	-6.63
		2472.00	-2.48	8.00	-10.48



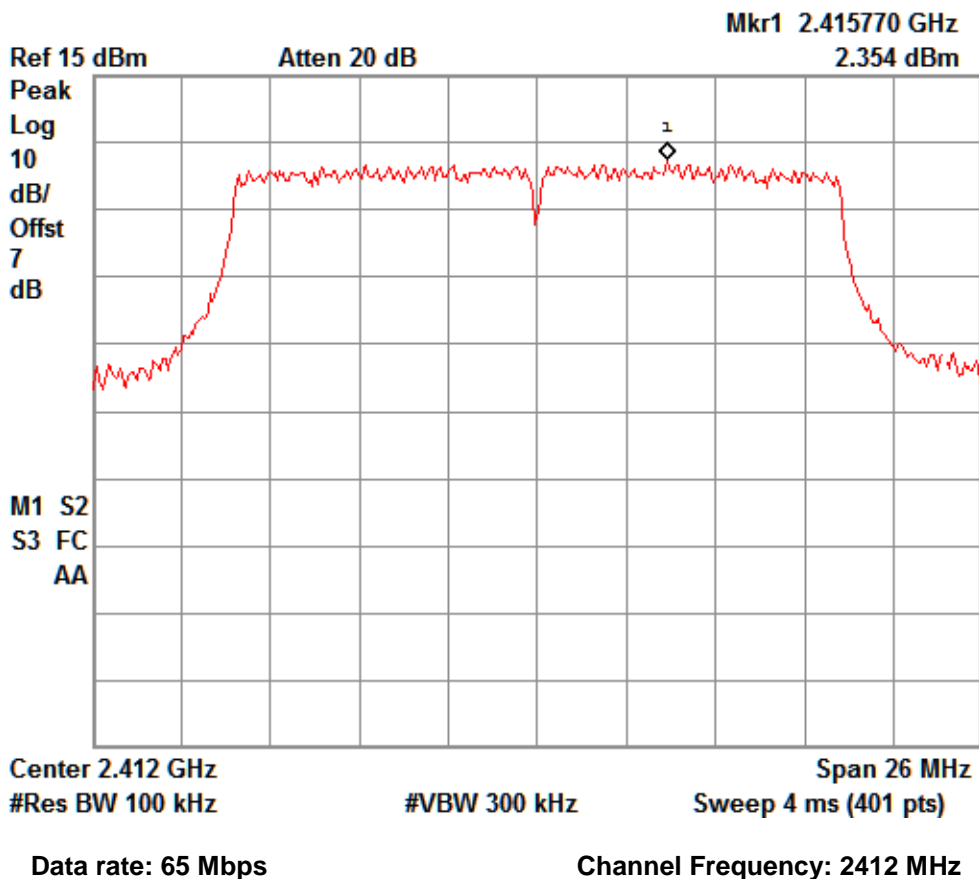
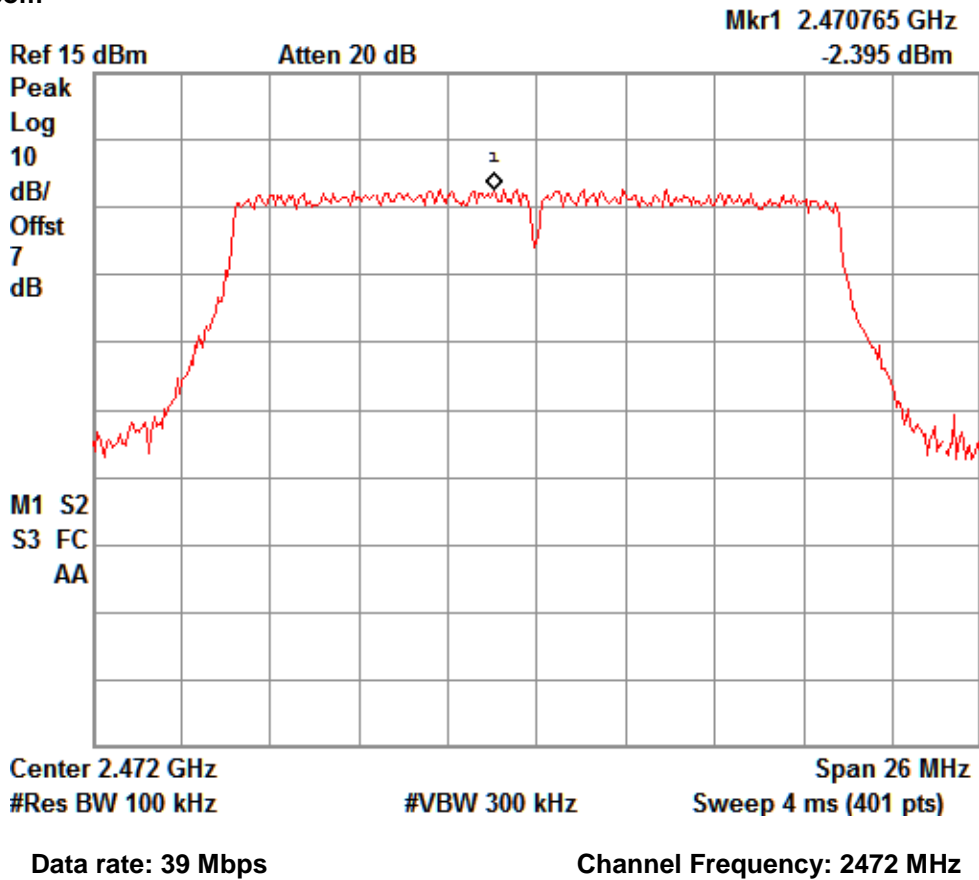
www.tuv.com



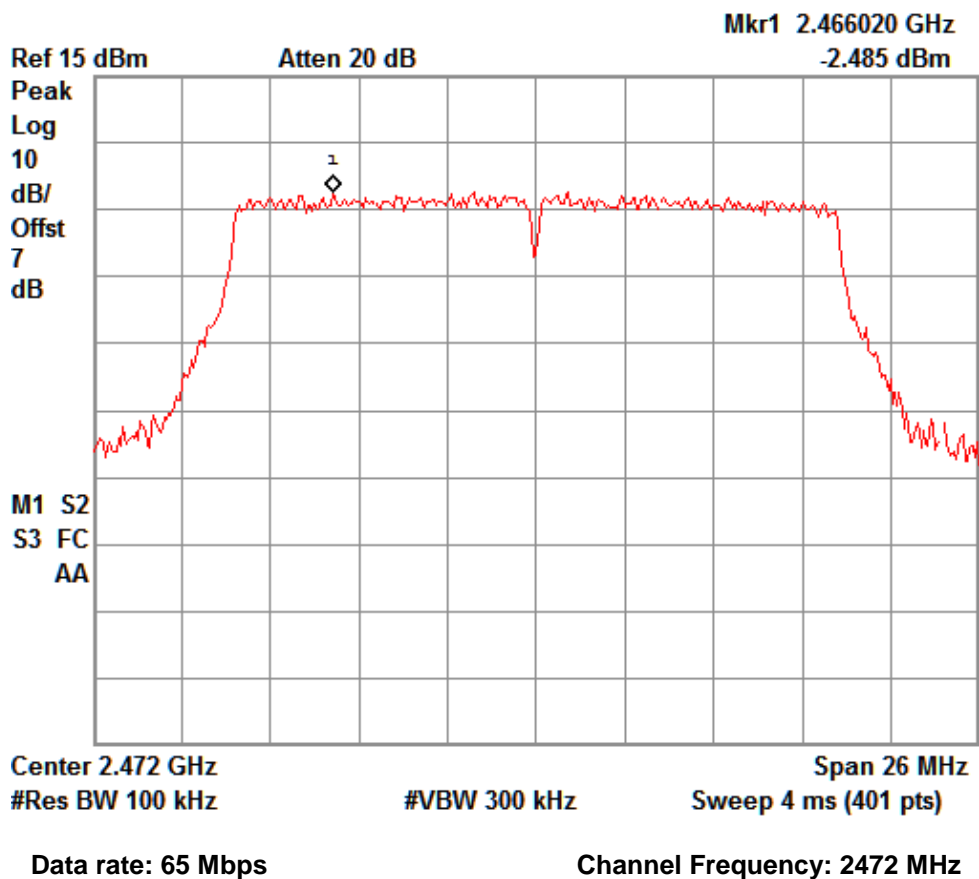
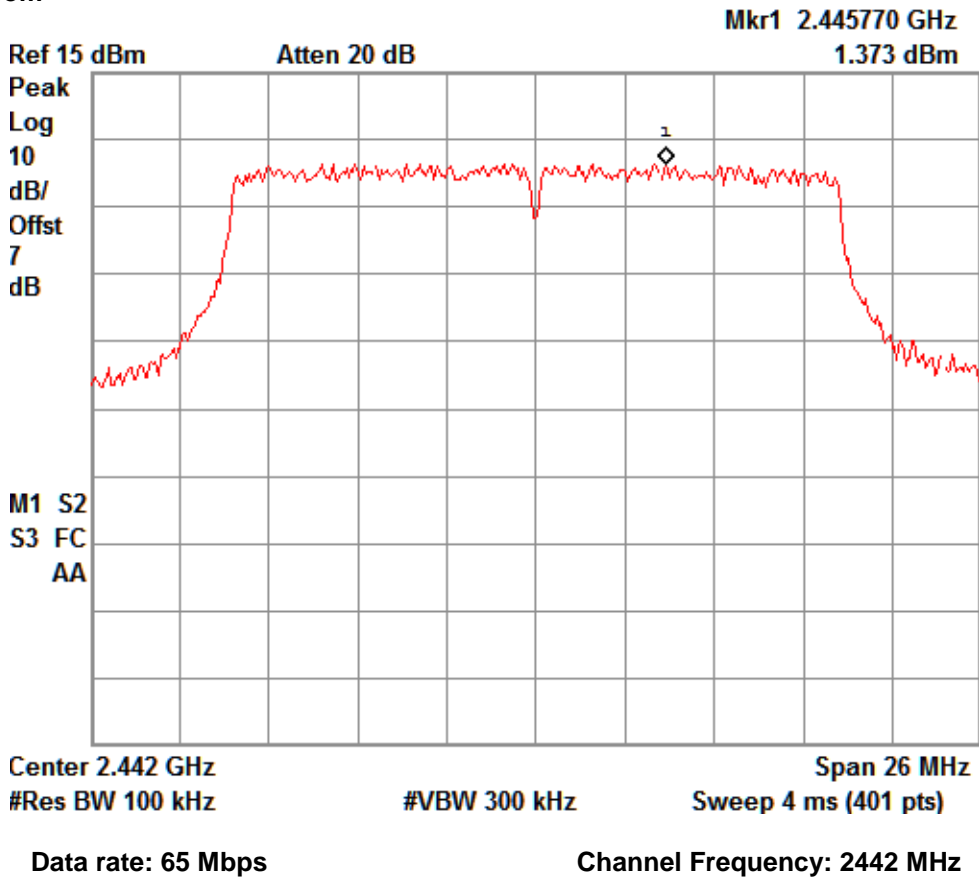
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6 dB Bandwidth

Section 15.247(a) (2)

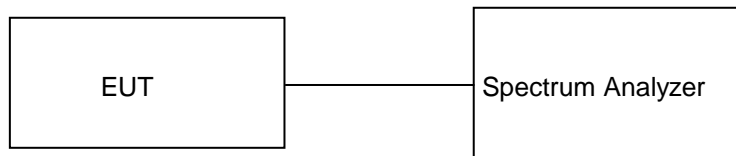
Result

Pass

Test Specification Requirement

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

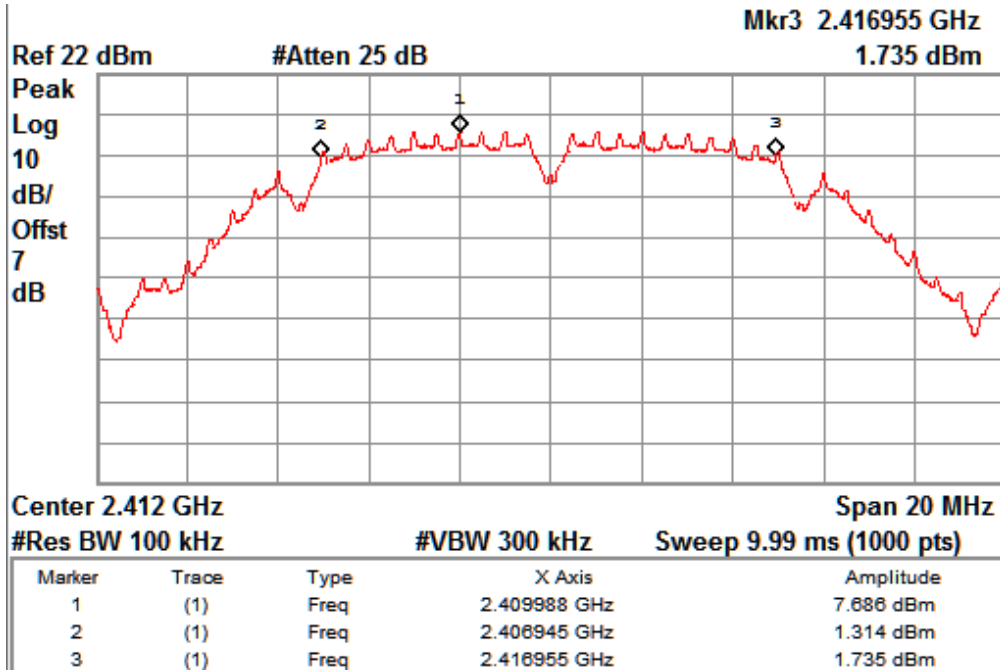
Test Method:



Test Result:

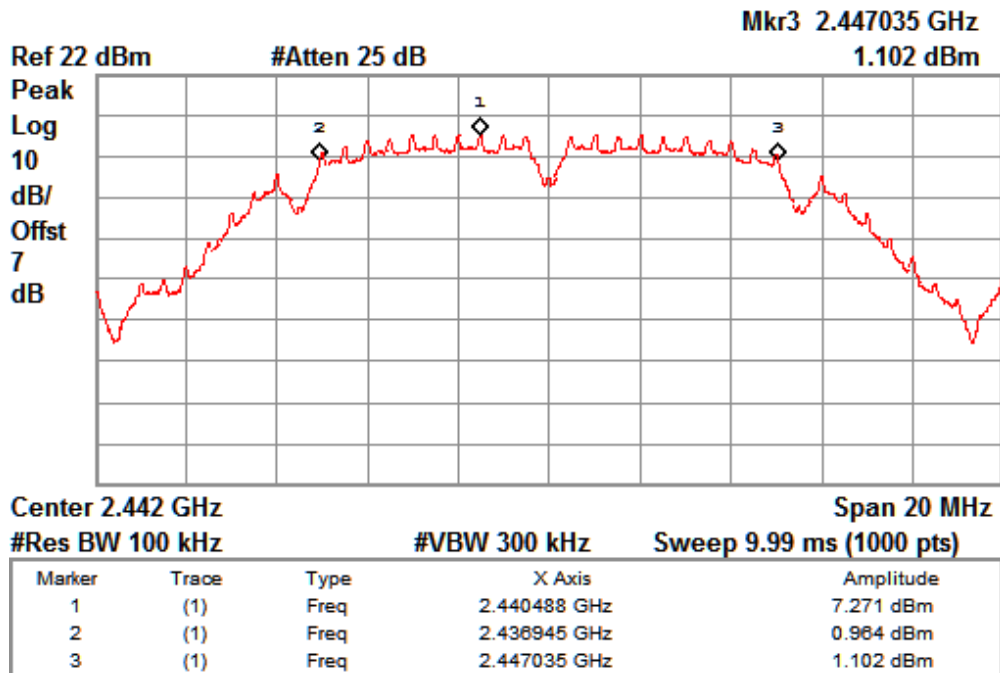
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
b	1	2412.00	2406.95	2416.96	10.01	11.99
		2442.00	2436.95	2447.04	10.09	12.00
		2472.00	2466.95	2477.04	10.09	11.97
	11	2412.00	2407.13	2416.71	9.58	11.98
		2442.00	2436.77	2446.95	10.18	11.90
		2472.00	2466.83	2476.87	10.04	11.92

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Data Rate: 1 Mbps

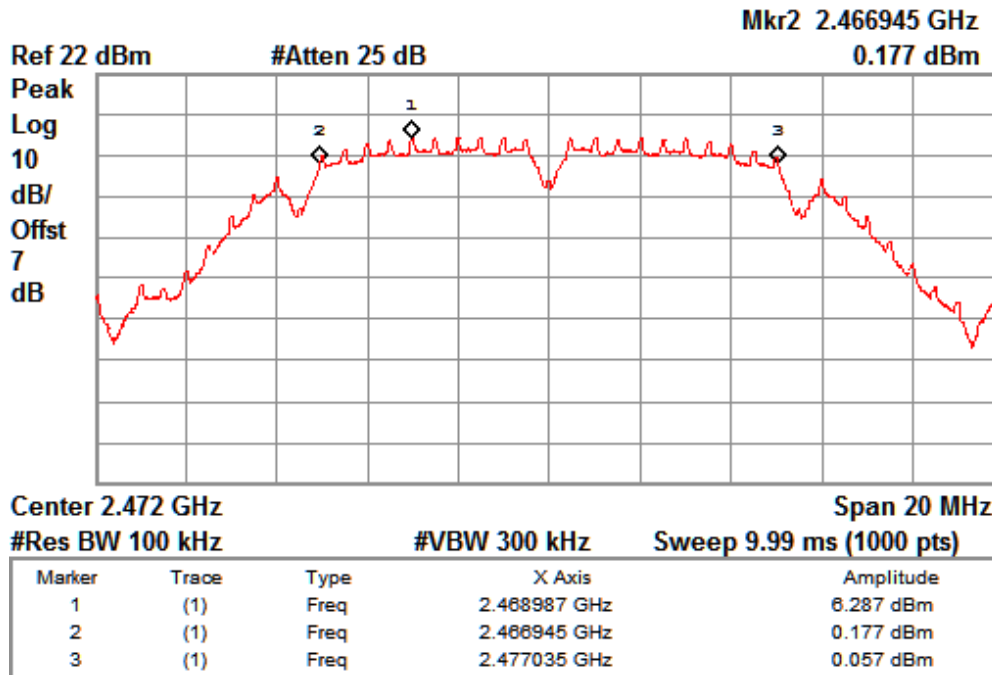
Channel frequency: 2412 MHz



Data Rate: 1 Mbps

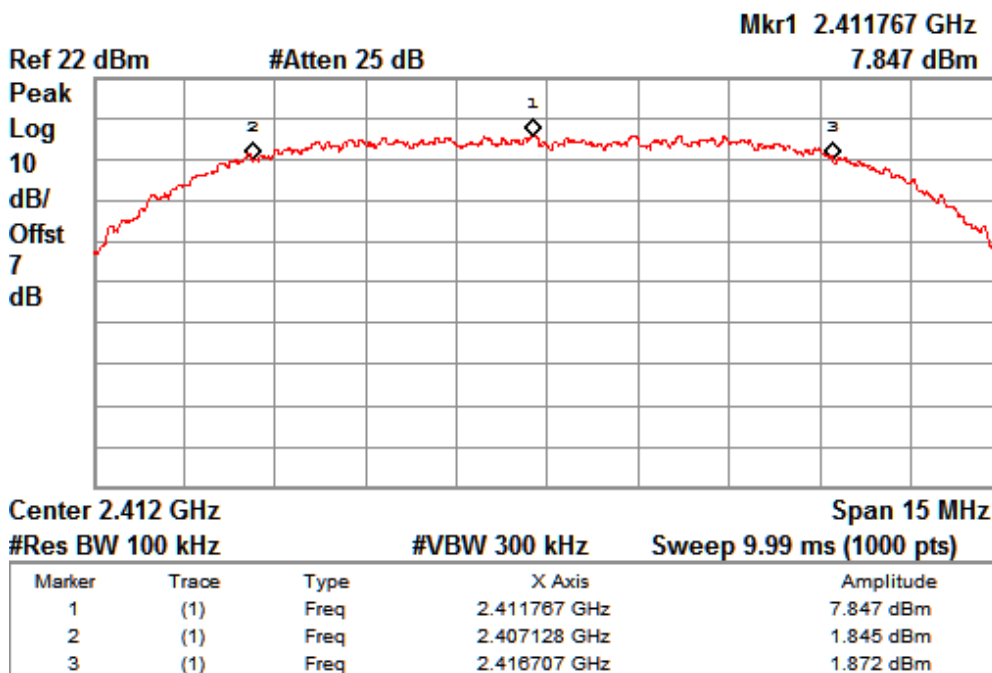
Channel frequency: 2442 MHz

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Data Rate: 1 Mbps

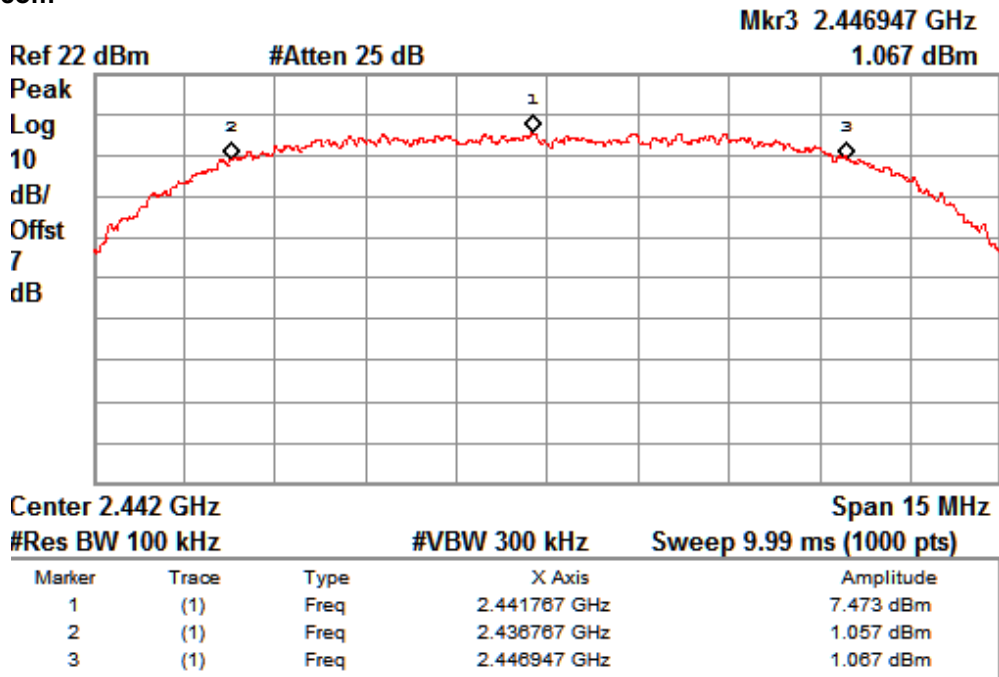
Channel frequency: 2472 MHz



Data Rate: 11 Mbps

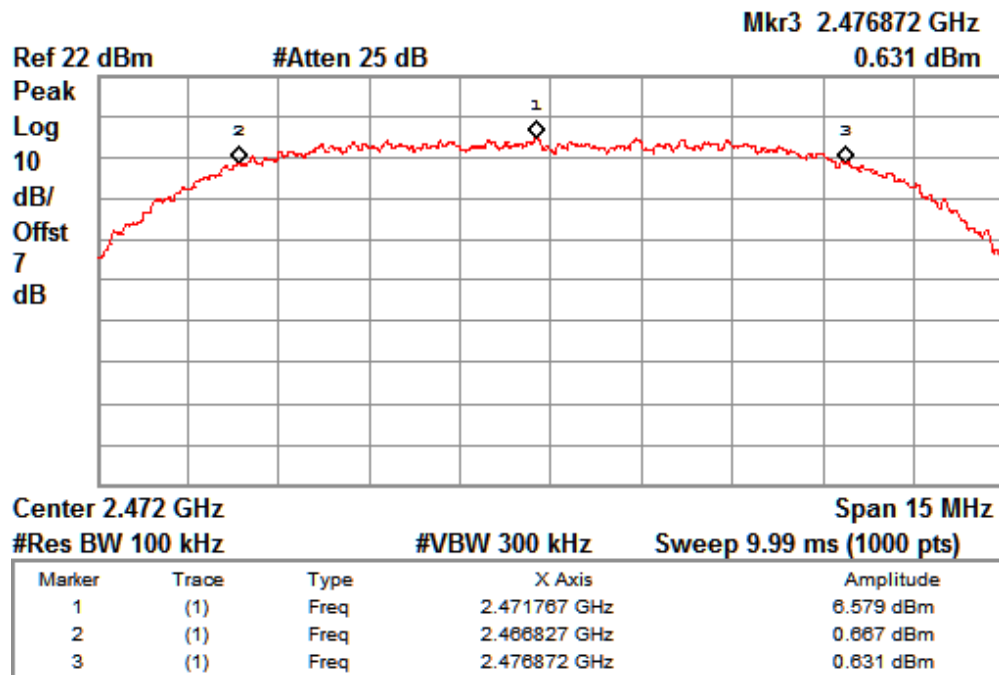
Channel frequencies: 2412 MHz

www.tuv.com



Data Rate: 11 Mbps

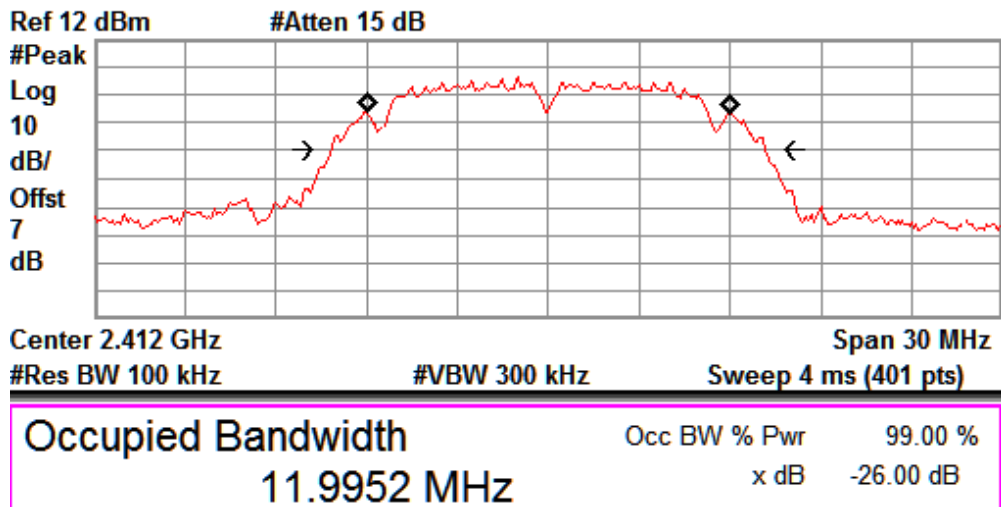
Channel frequency: 2442 MHz



Data Rate: 11 Mbps

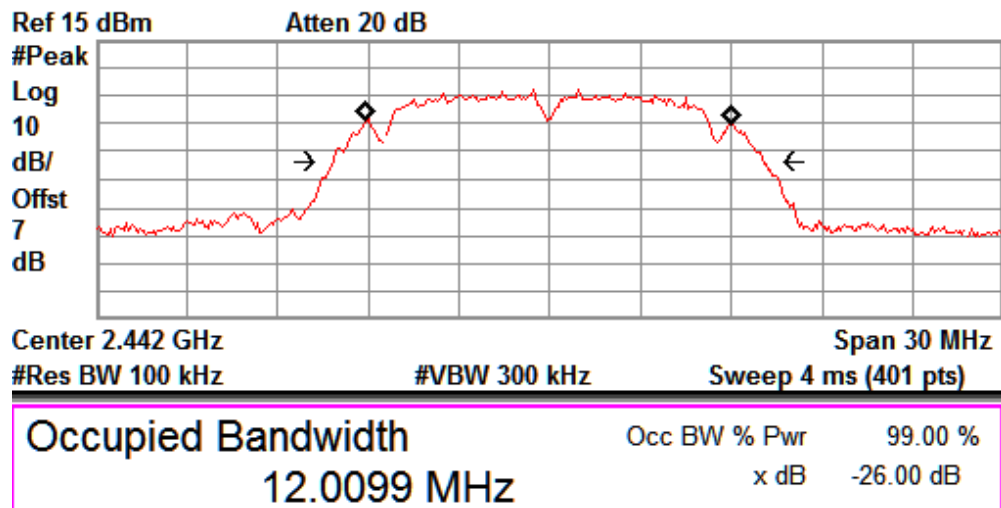
Channel frequency: 2472 MHz

www.tuv.com



Data rate: 1 Mbps

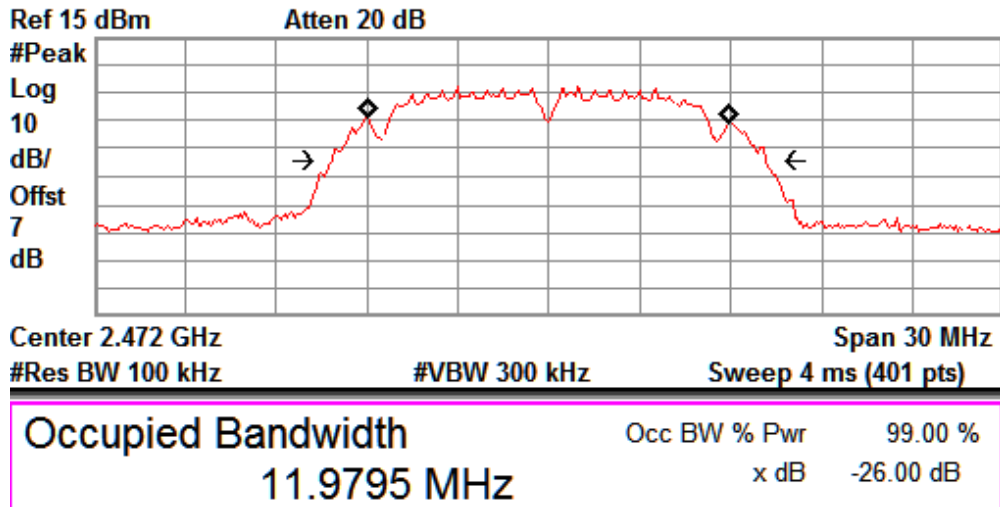
99% Occupied Bandwidth: Channel 2412MHz



Data rate: 1 Mbps

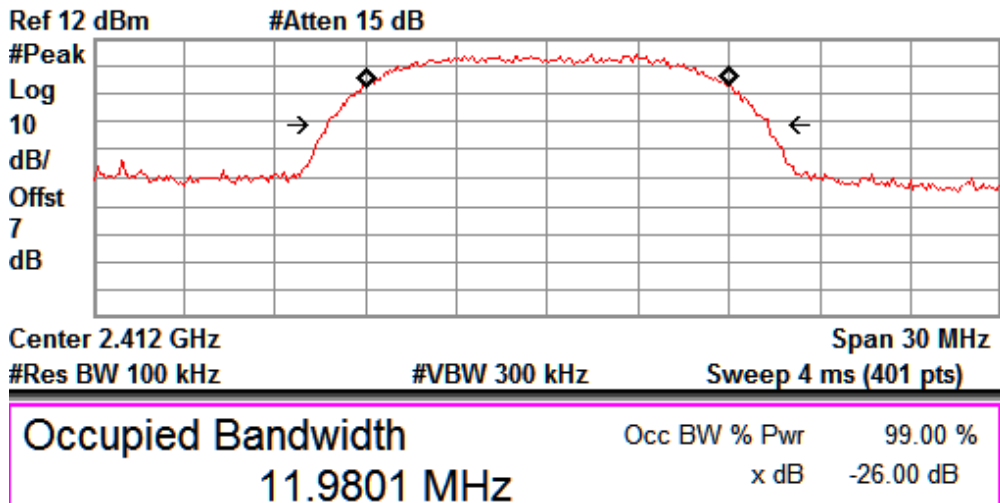
99% Occupied Bandwidth: Channel 2442MHz

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Data rate: 1 Mbps

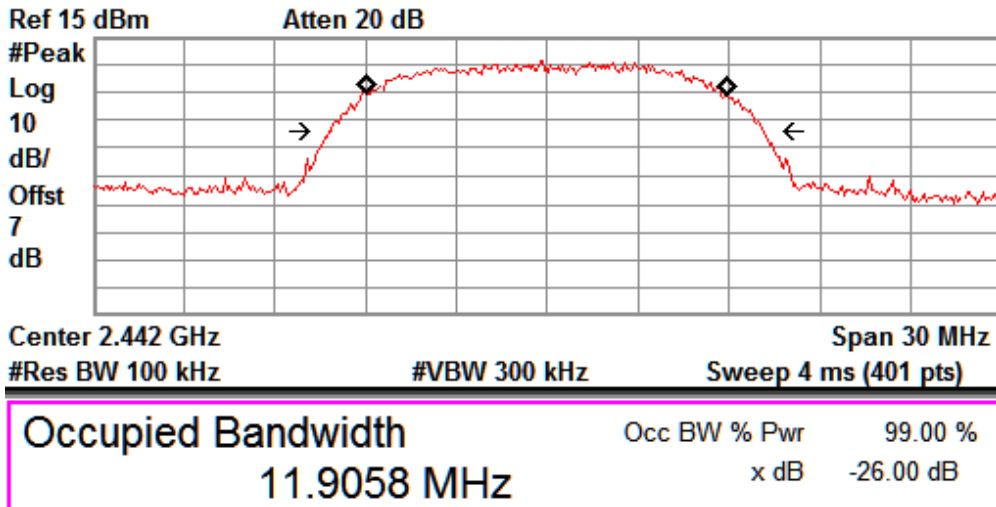
99% Occupied Bandwidth: Channel 2472MHz



Data rate: 11 Mbps

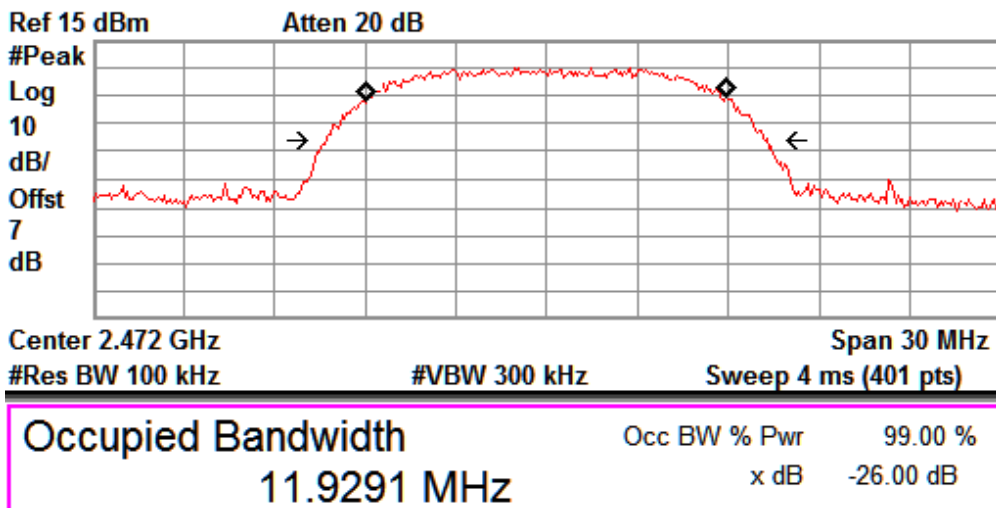
99% Occupied Bandwidth: Channel 2412MHz

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Data rate: 11 Mbps

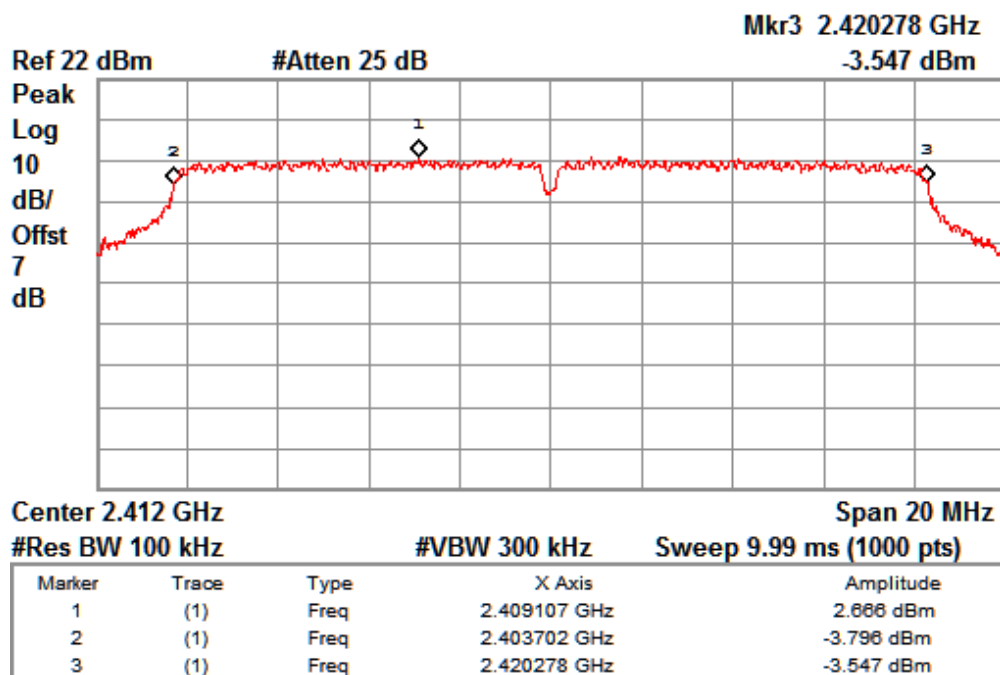
99% Occupied Bandwidth: Channel 2442MHz



Data rate: 11 Mbps

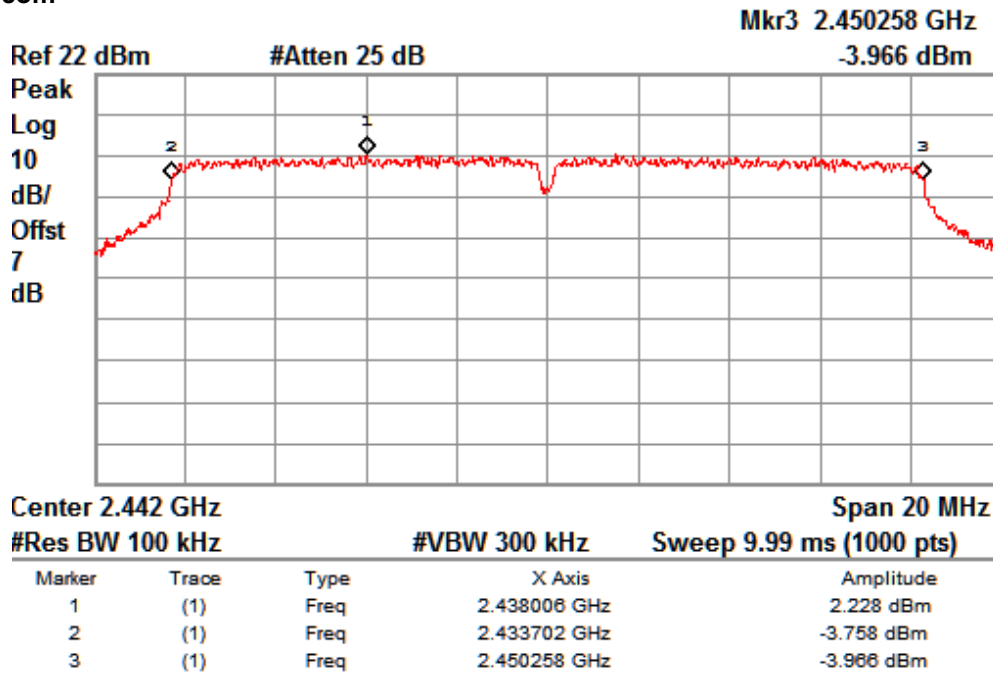
99% Occupied Bandwidth: Channel 2472MHz

802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
g	6	2412.00	2403.70	2420.28	16.58	16.49
		2442.00	2433.70	2450.26	16.56	16.50
		2472.00	2463.68	2480.28	16.60	16.46
	24	2412.00	2403.74	2420.26	16.52	16.44
		2442.00	2433.74	2450.24	16.50	16.44
		2472.00	2463.72	2480.26	16.54	16.40
	54	2412.00	2403.70	2420.26	16.56	16.44
		2442.00	2433.70	2450.26	16.56	16.42
		2472.00	2463.68	2480.24	16.56	16.43



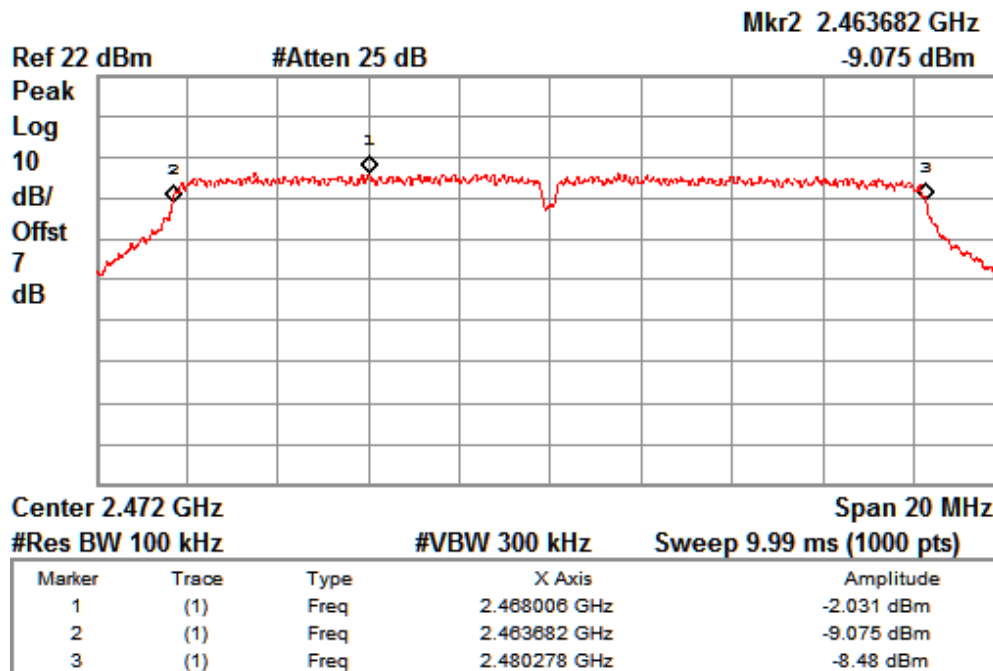
Data Rate: 6 Mbps

Channel frequencies: 2412 MHz



Data Rate: 6 Mbps

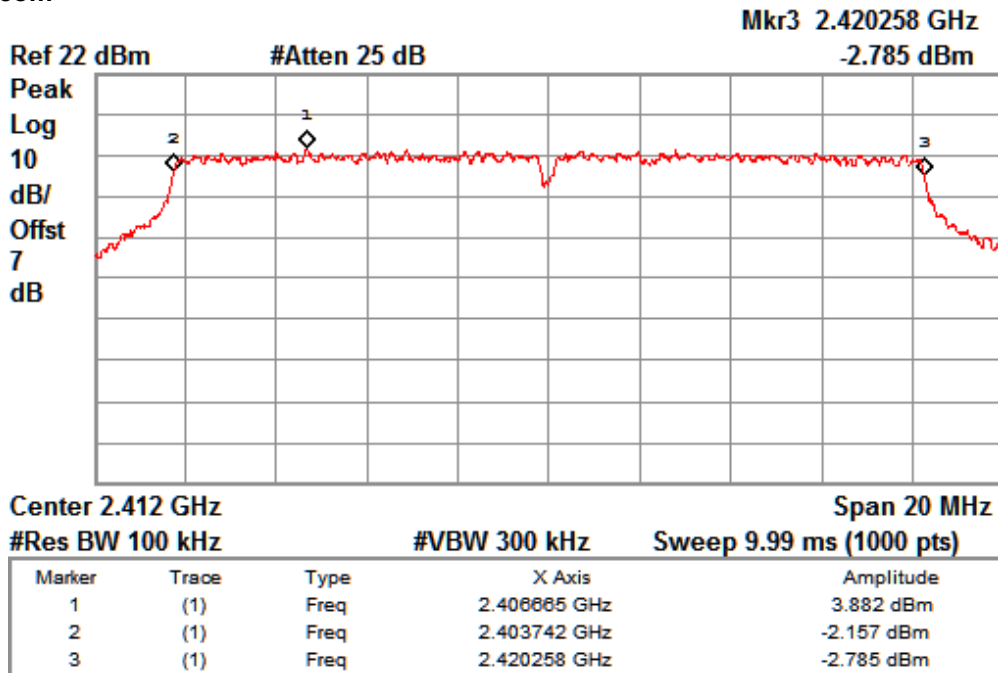
Channel frequencies: 2442 MHz



Data Rate: 6 Mbps

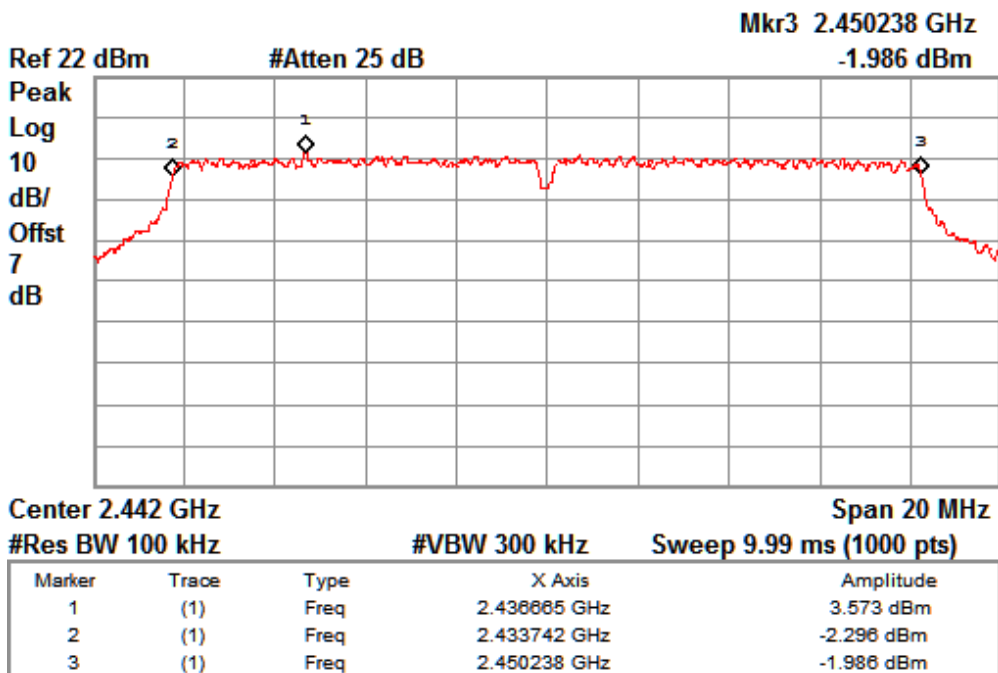
Channel frequencies: 2472 MHz

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Data Rate: 24 Mbps

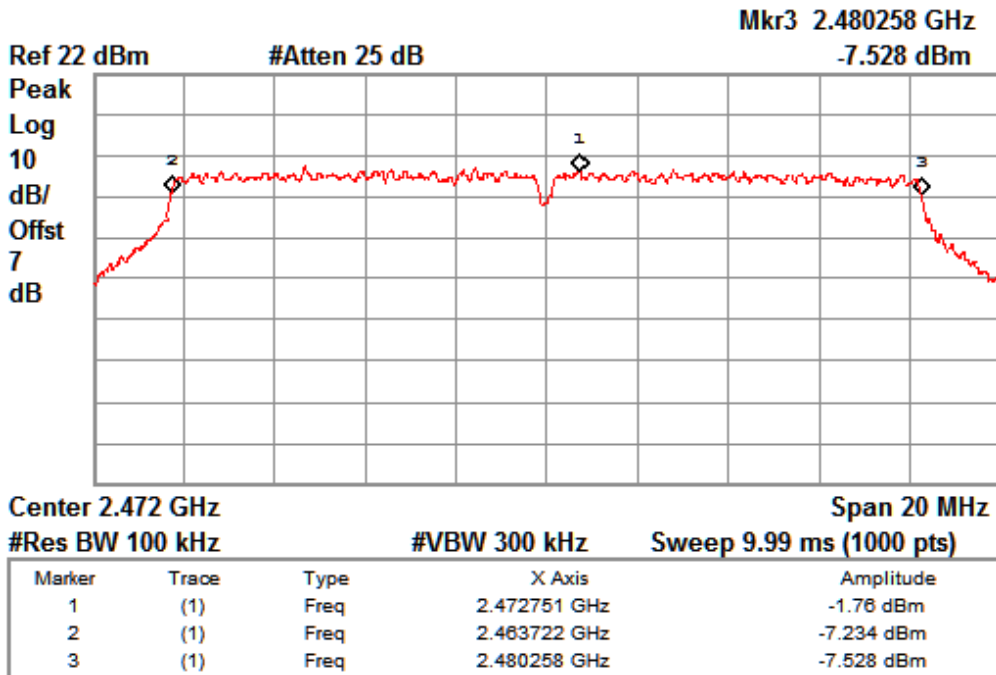
Channel frequencies: 2412 MHz



Data Rate: 24 Mbps

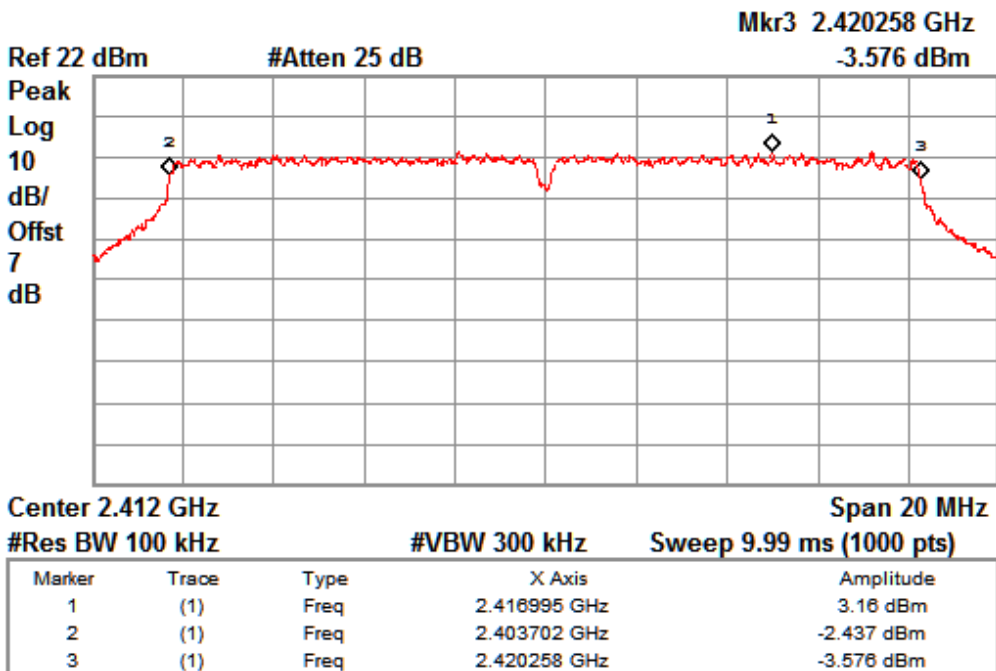
Channel frequencies: 2442 MHz

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Data Rate: 24 Mbps

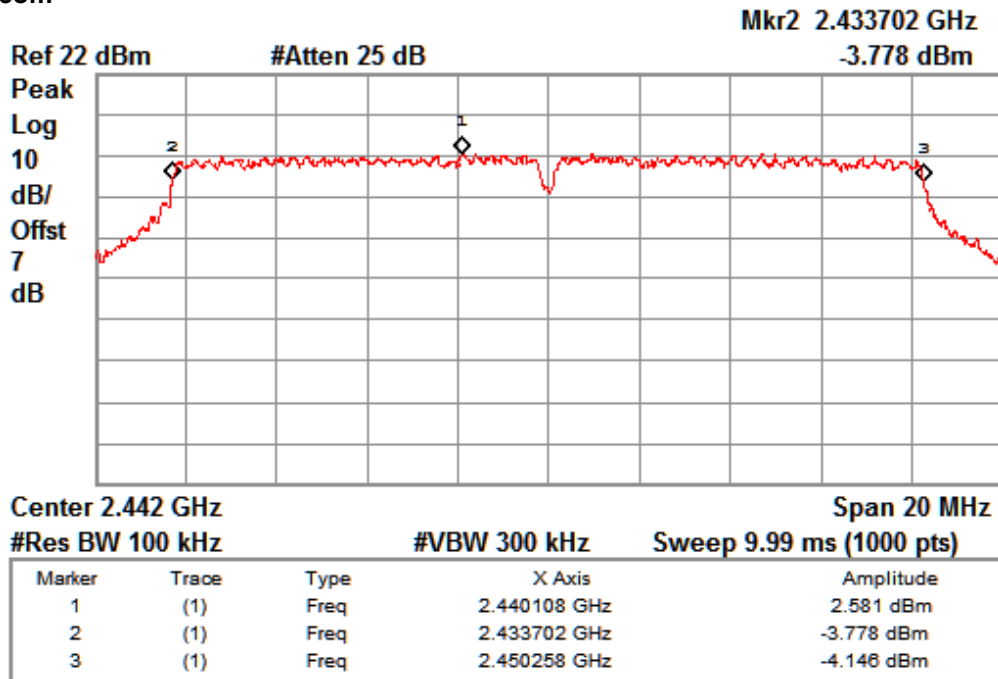
Channel frequencies: 2472 MHz



Data Rate: 54 Mbps

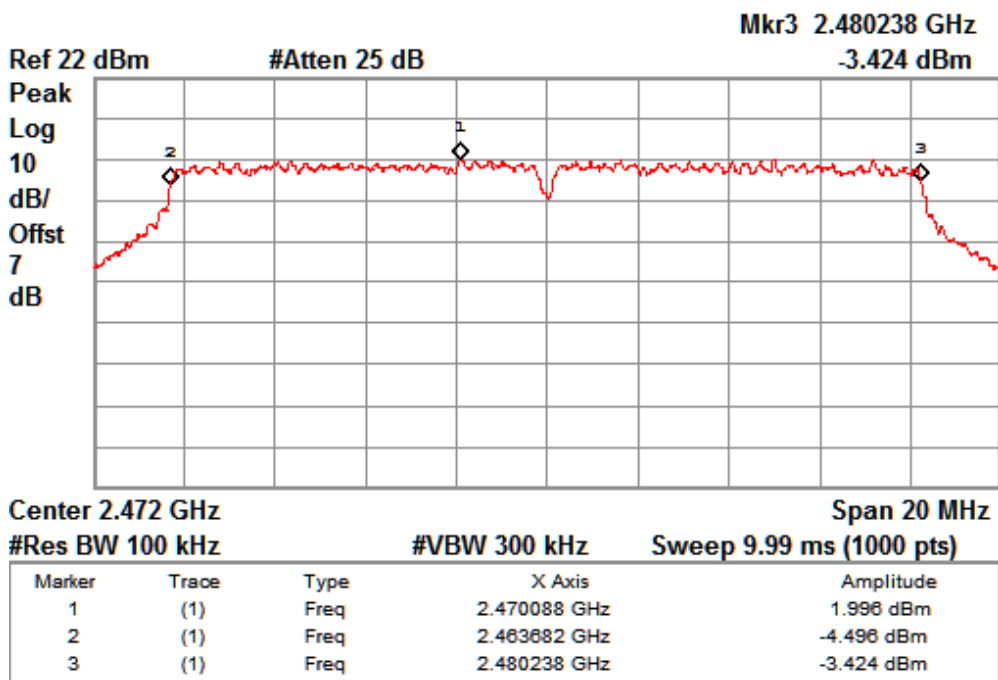
Channel frequencies: 2412 MHz

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Data Rate: 54 Mbps

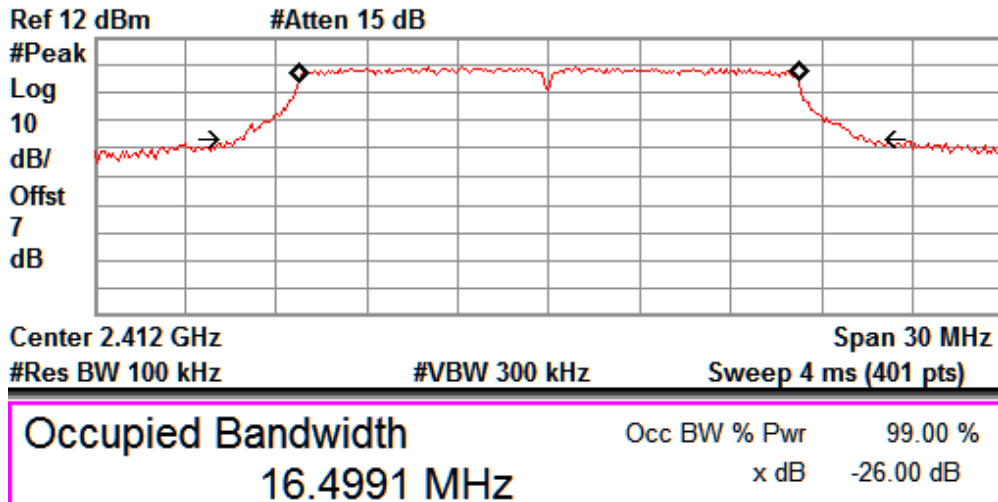
Channel frequencies: 2442MHz



Data Rate: 54 Mbps

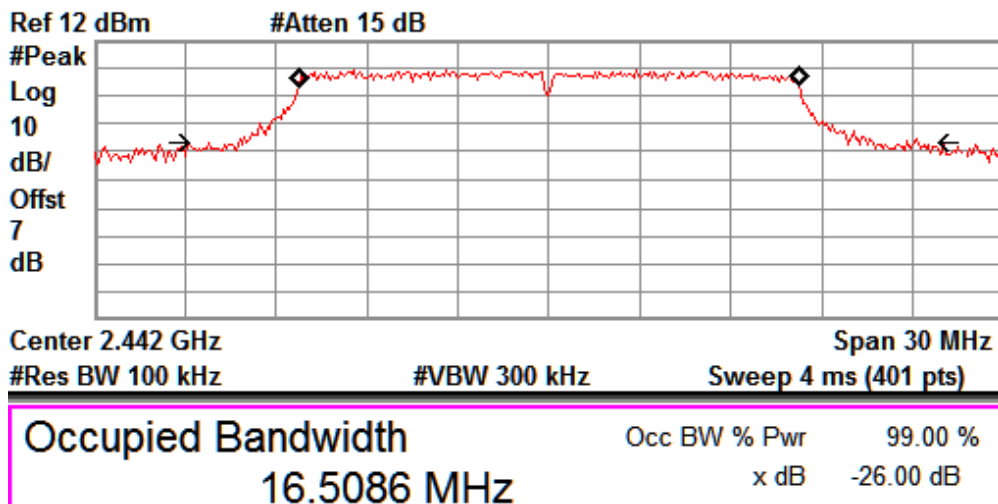
Channel frequencies: 2472 MHz

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Data Rate: 6 Mbps

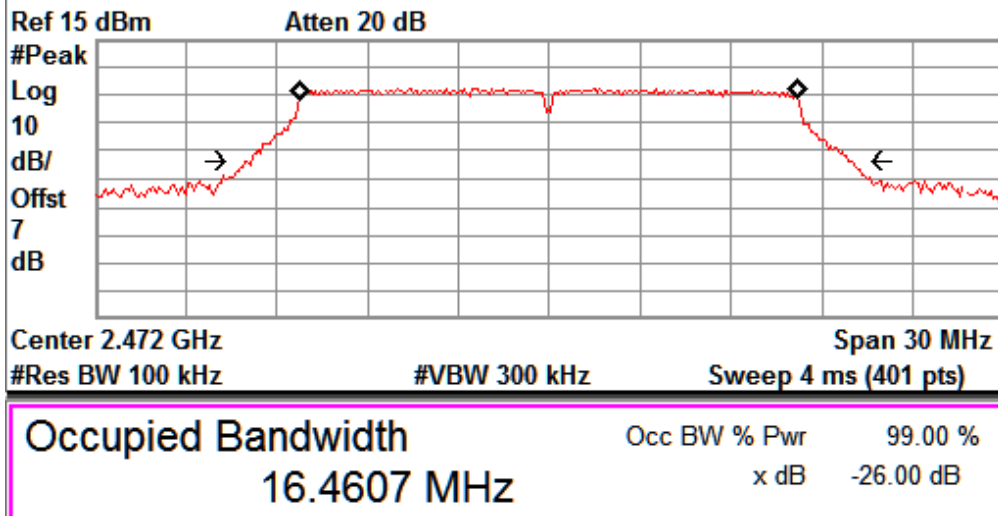
99% Occupied Bandwidth: Channel 2412MHz



Data Rate: 6 Mbps

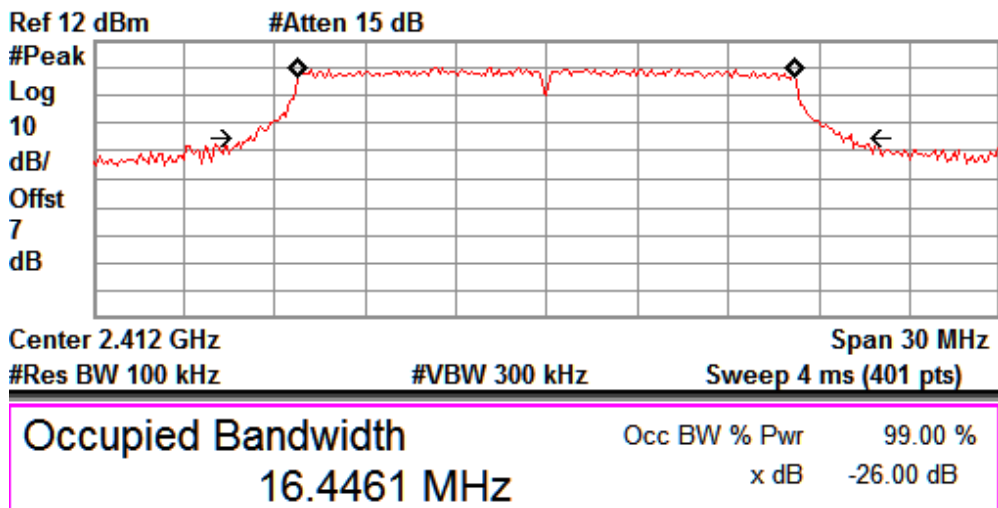
99% Occupied Bandwidth: Channel 2442MHz

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Data Rate: 6 Mbps

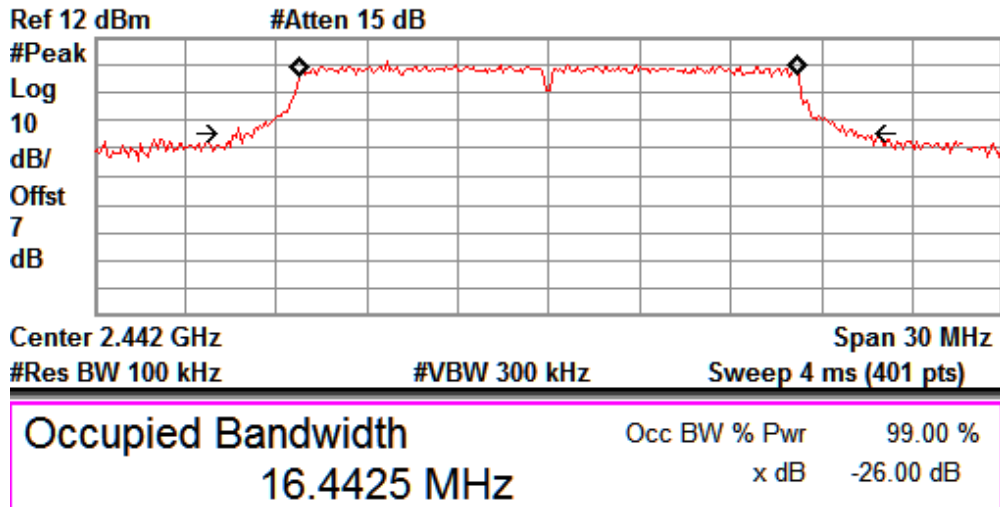
99% Occupied Bandwidth: Channel 2472MHz



Data Rate: 24 Mbps

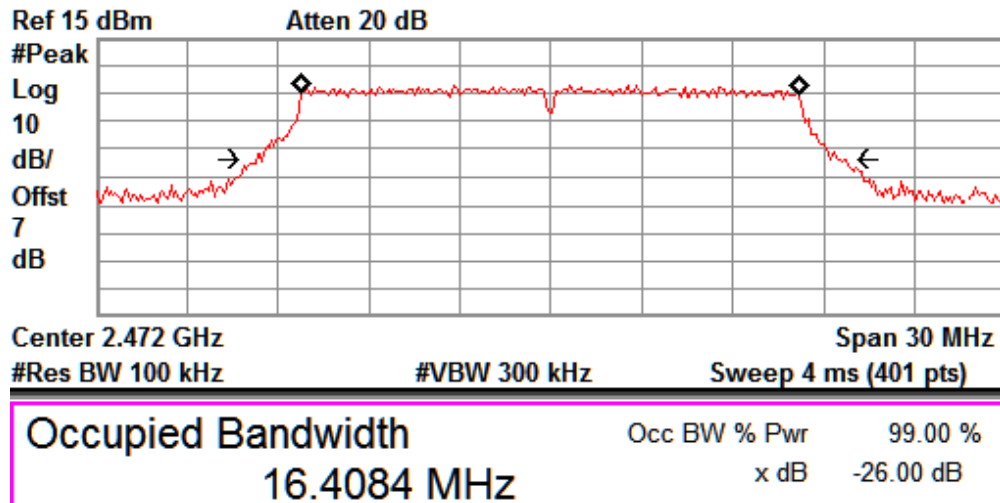
99% Occupied Bandwidth: Channel 2412MHz

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Data Rate: 24 Mbps

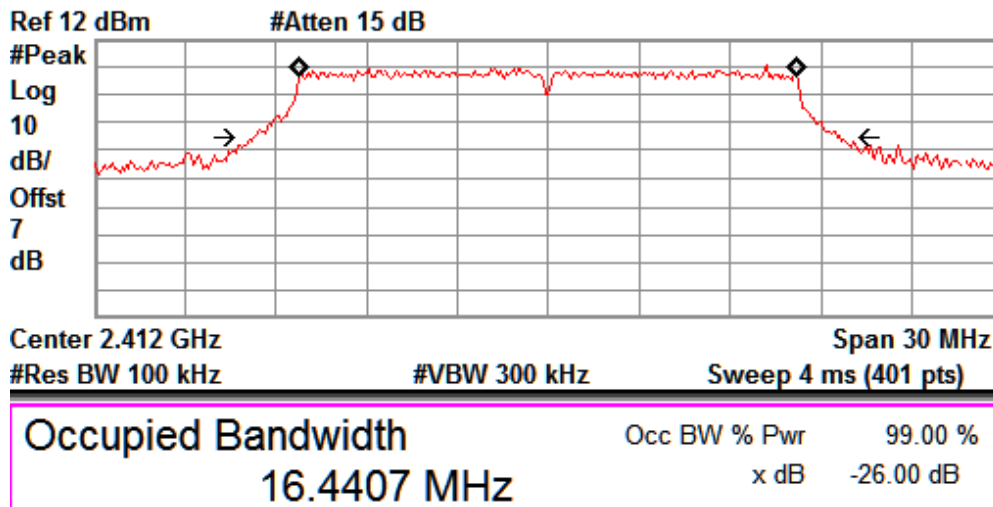
99% Occupied Bandwidth: Channel 2442MHz



Data Rate: 24 Mbps

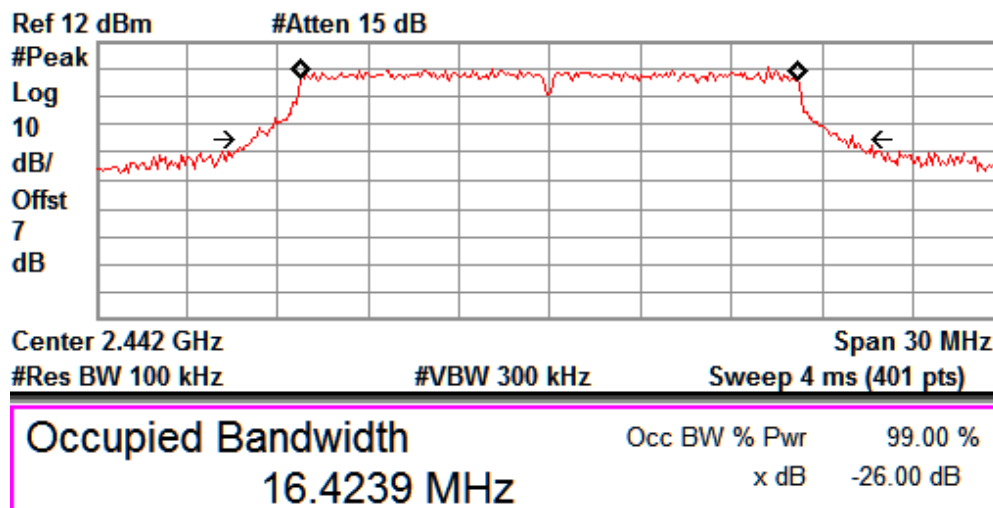
99% Occupied Bandwidth: Channel 2472MHz

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Data Rate: 54 Mbps

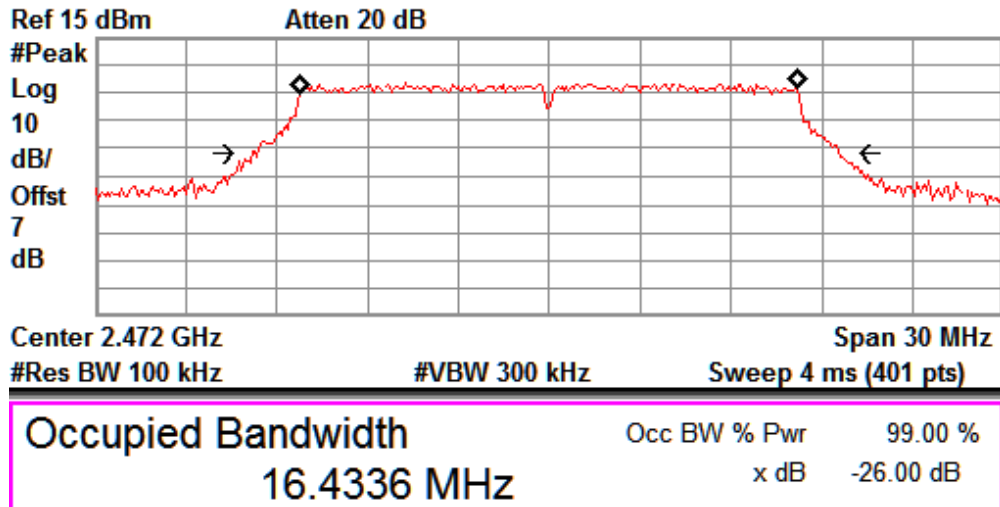
99% Occupied Bandwidth: Channel 2412MHz



Data Rate: 54 Mbps

99% Occupied Bandwidth: Channel 2442MHz

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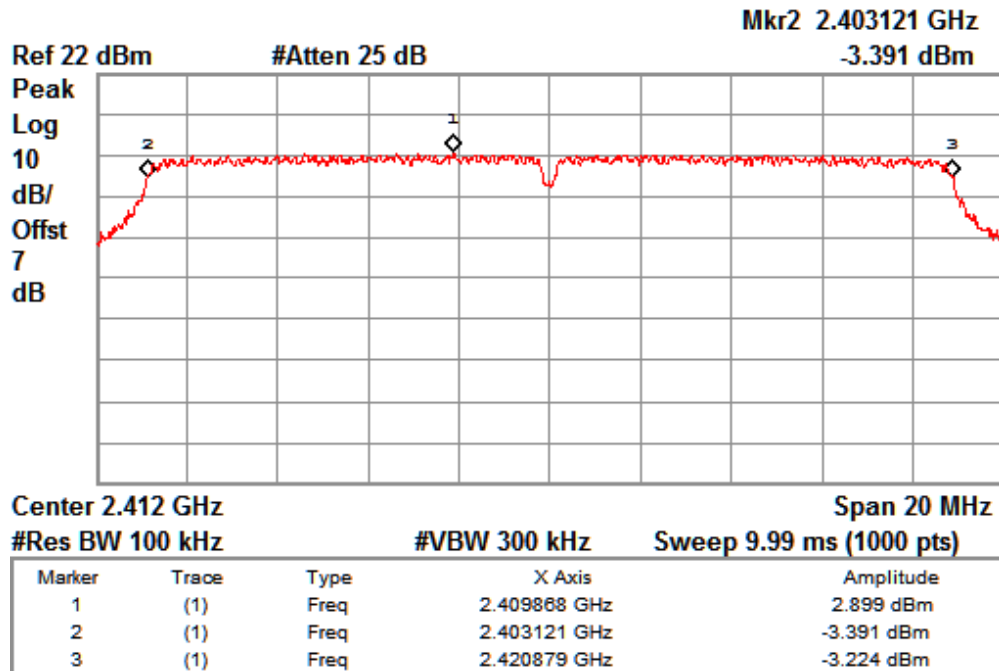


Data Rate: 54 Mbps

99% Occupied Bandwidth: Channel 2472MHz

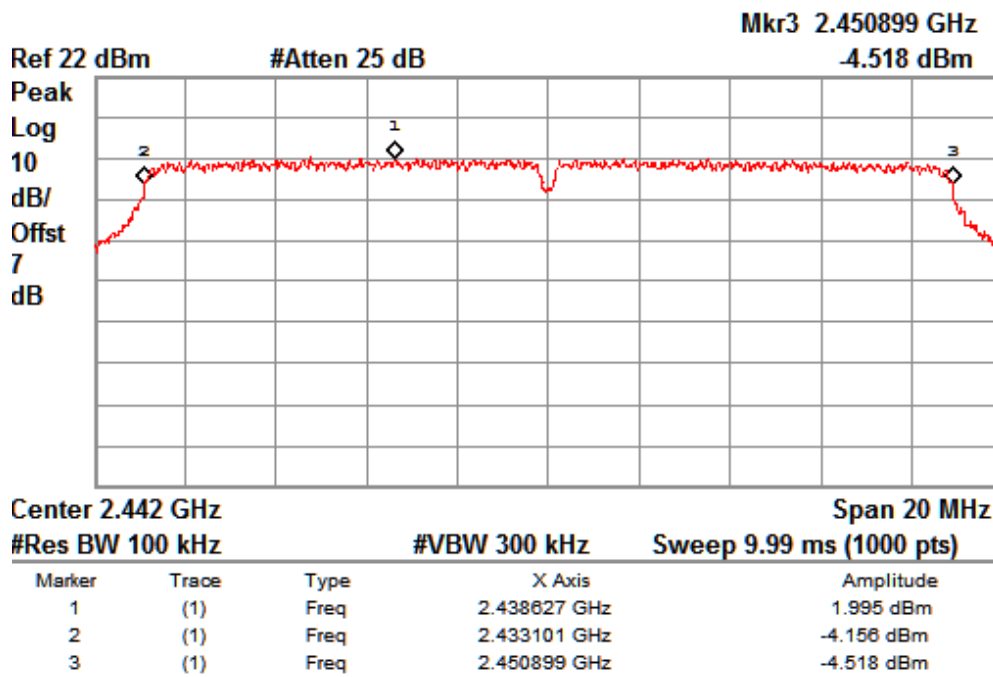
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Lower Frequency (MHz)	Upper Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
n	6.5	2412.00	2403.12	2420.88	17.76	17.61
		2442.00	2433.10	2450.90	17.80	17.63
		2472.00	2463.08	2480.84	17.76	17.61
	39	2412.00	2403.10	2420.88	17.78	17.60
		2442.00	2433.10	2450.86	17.76	17.63
		2472.00	2463.10	2480.88	17.78	17.61
	65	2412.00	2403.10	2420.88	17.78	17.63
		2442.00	2433.12	2450.88	17.76	17.63
		2472.00	2463.10	2480.88	17.78	17.57

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Data Rate: 6.5 Mbps

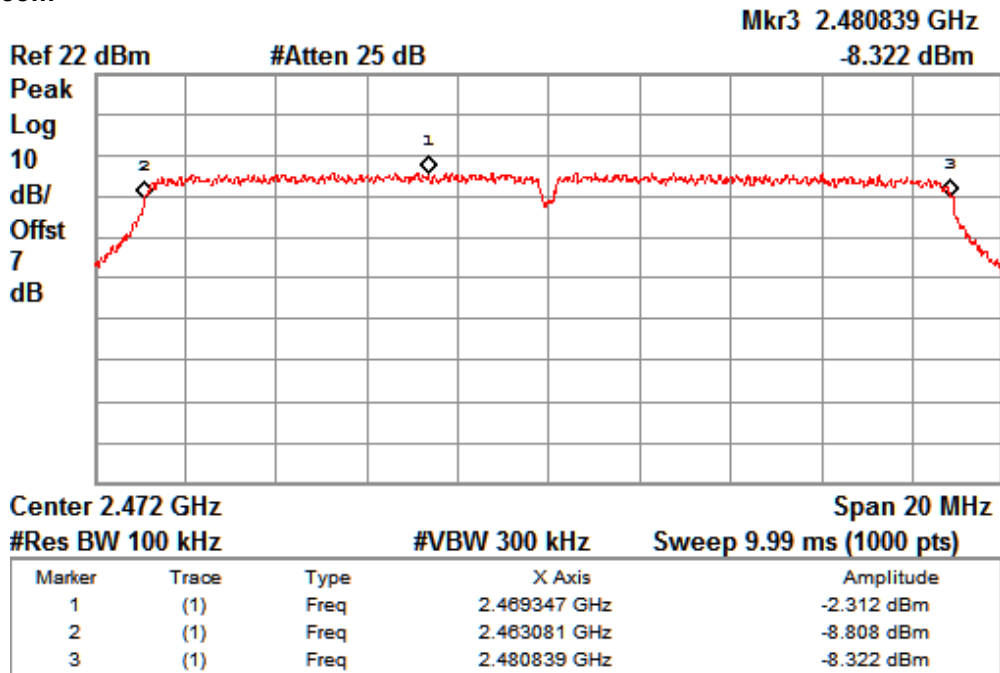
Channel frequencies: 2412 MHz



Data Rate: 6.5 Mbps

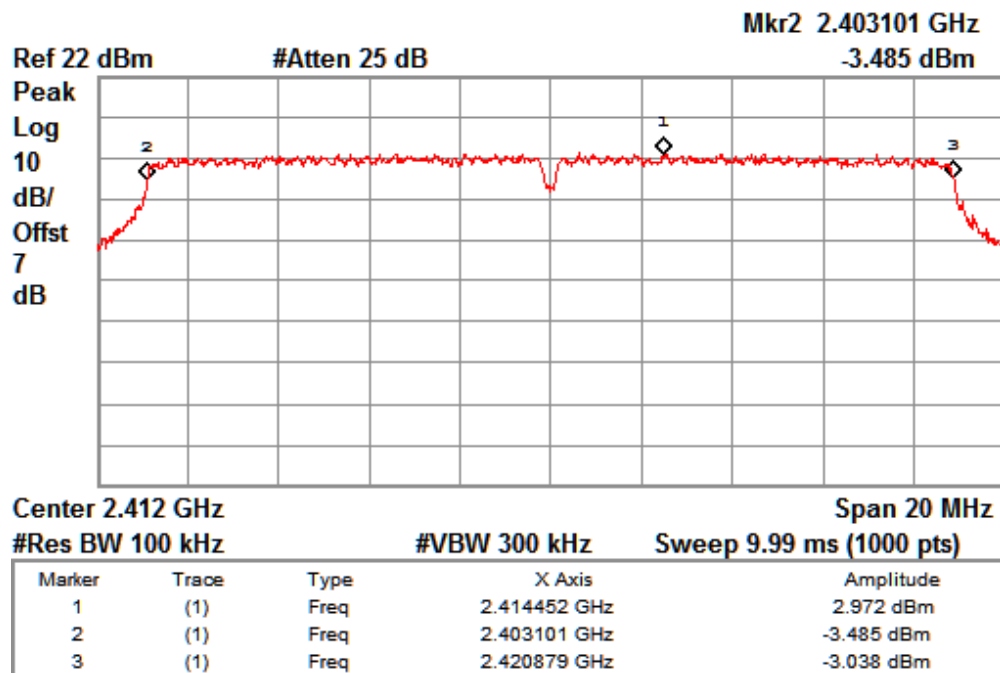
Channel frequencies: 2442 MHz

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Data Rate: 6.5 Mbps

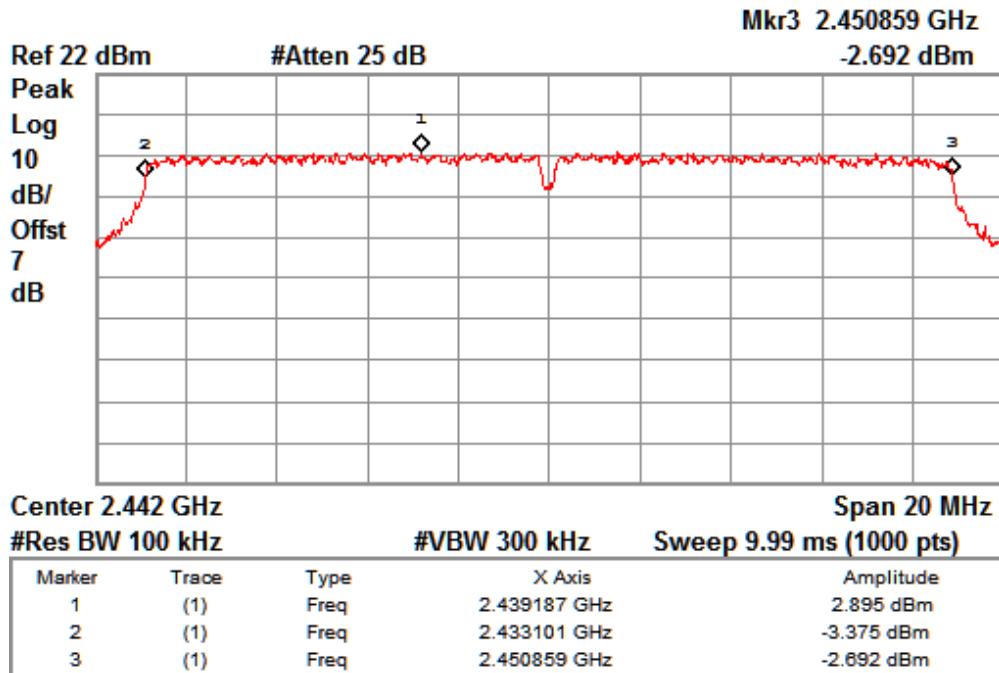
Channel frequencies: 2472 MHz



Data Rate: 39 Mbps

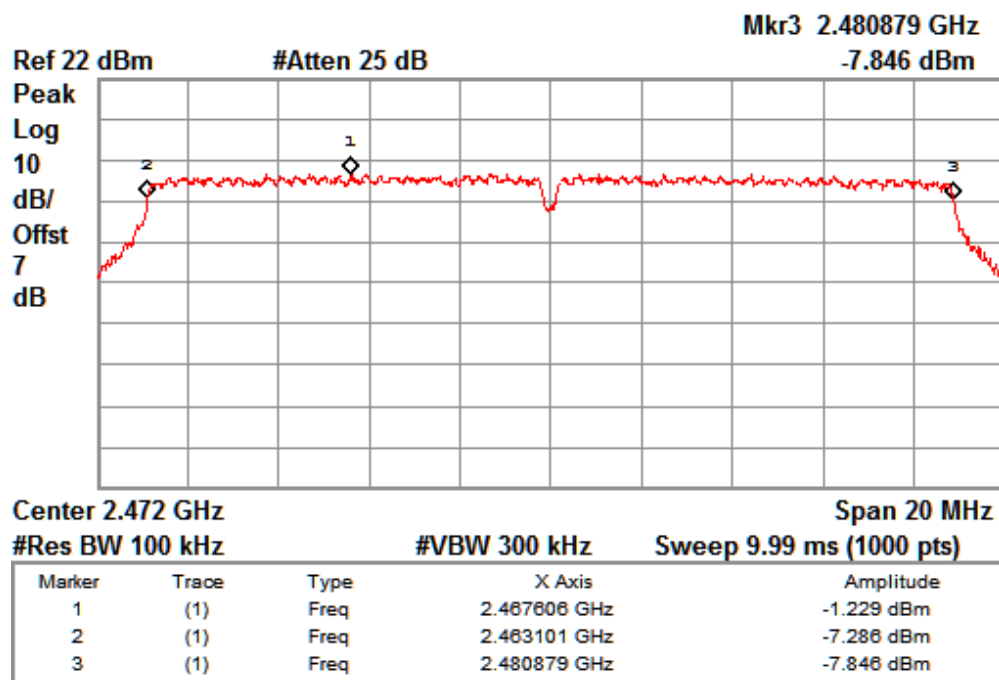
Channel frequencies: 2412 MHz

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Data Rate: 39 Mbps

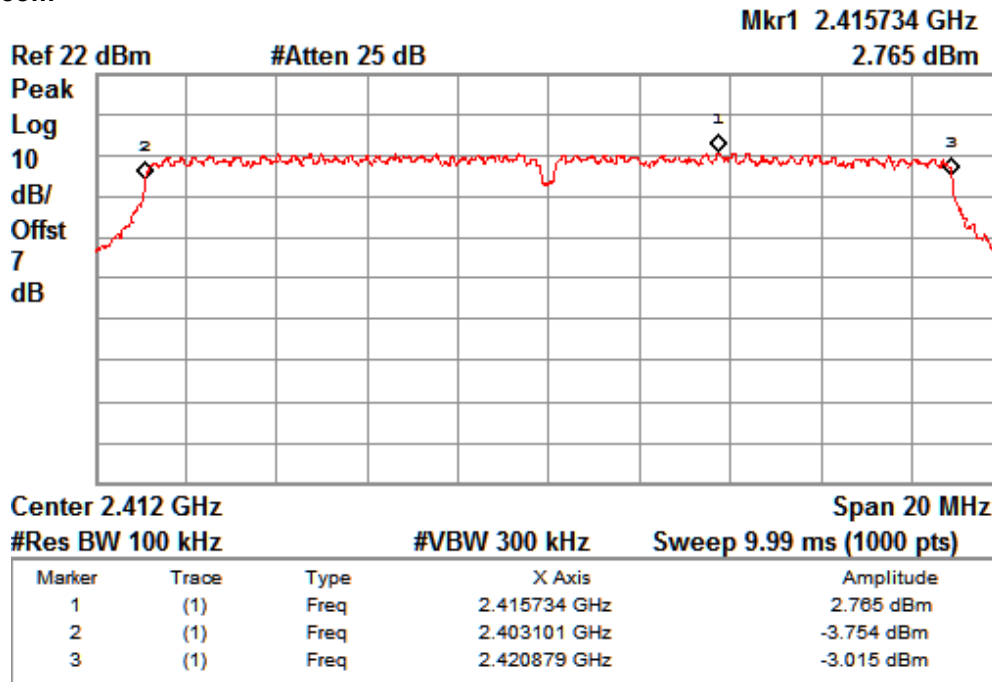
Channel frequencies: 2442 MHz



Data Rate: 39 Mbps

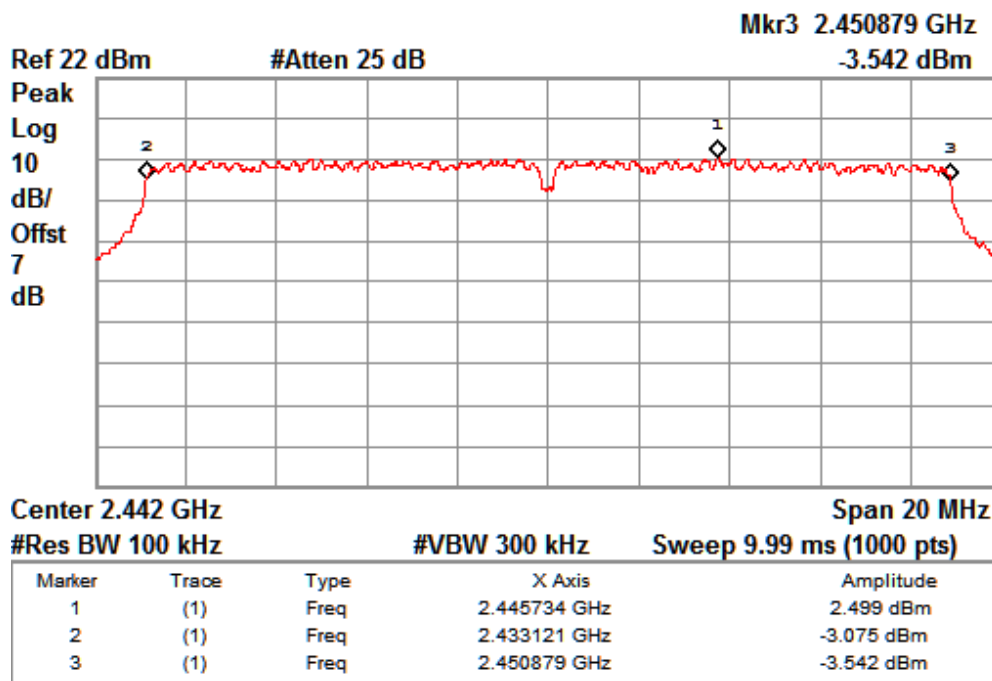
Channel frequencies: 2472 MHz

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Data Rate: 65 Mbps

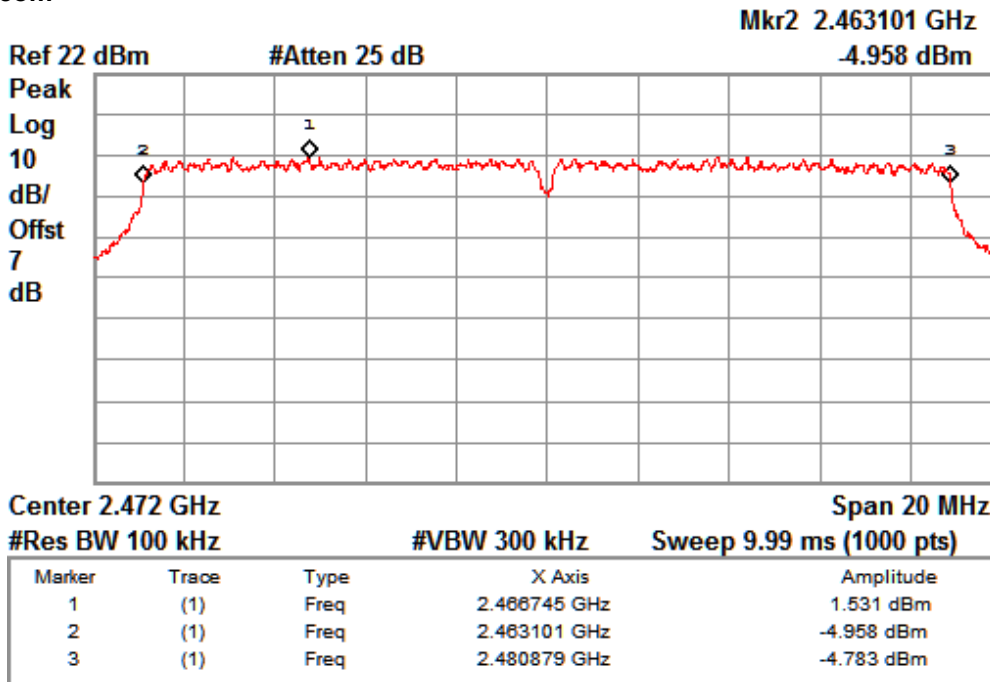
Channel frequencies: 2412 MHz



Data Rate: 65 Mbps

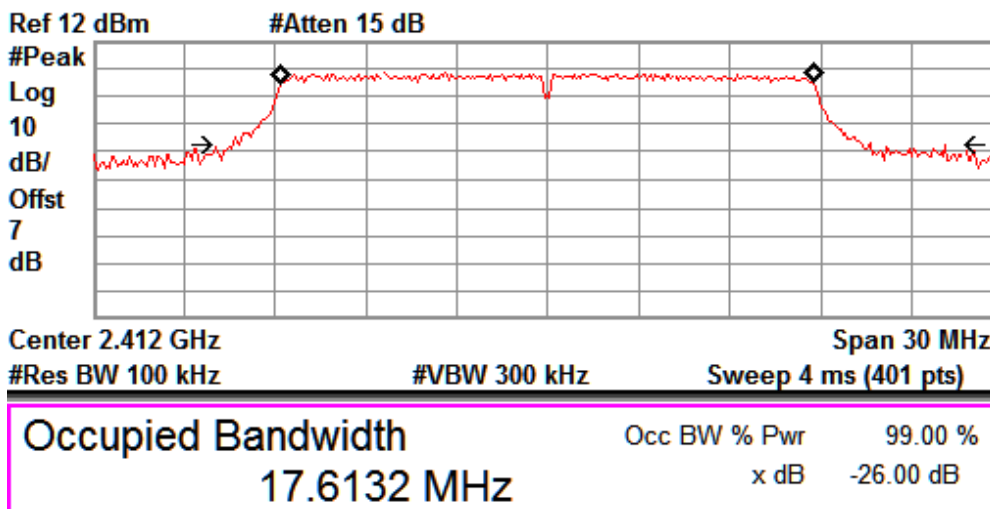
Channel frequencies: 2442MHz

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Data Rate: 65 Mbps

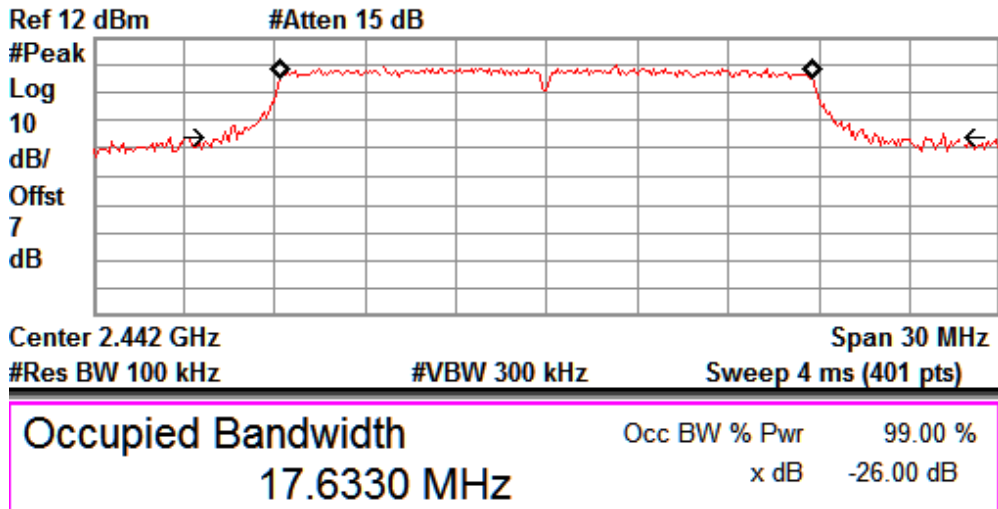
Channel frequencies: 2472 MHz



Data Rate: 6.5 Mbps

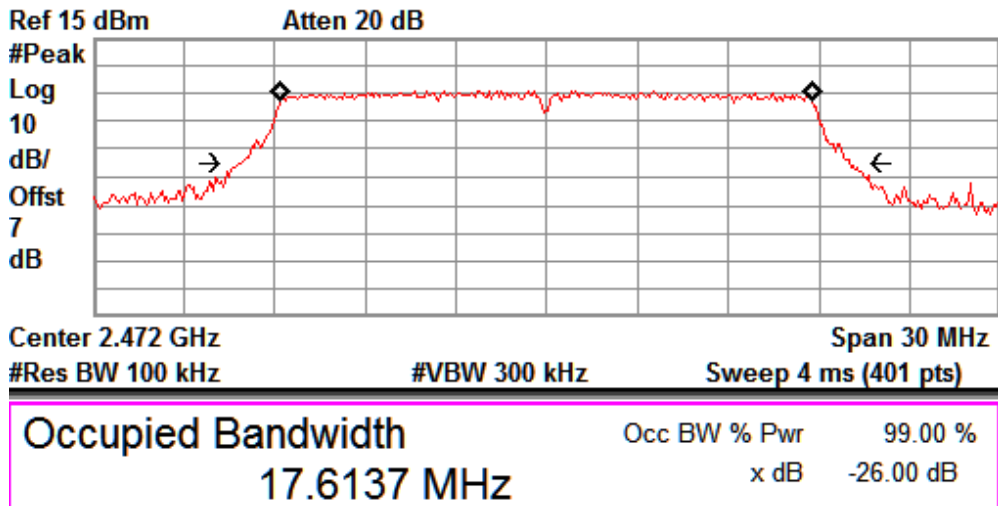
99% Occupied Bandwidth: Channel 2412MHz

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Data Rate: 6.5 Mbps

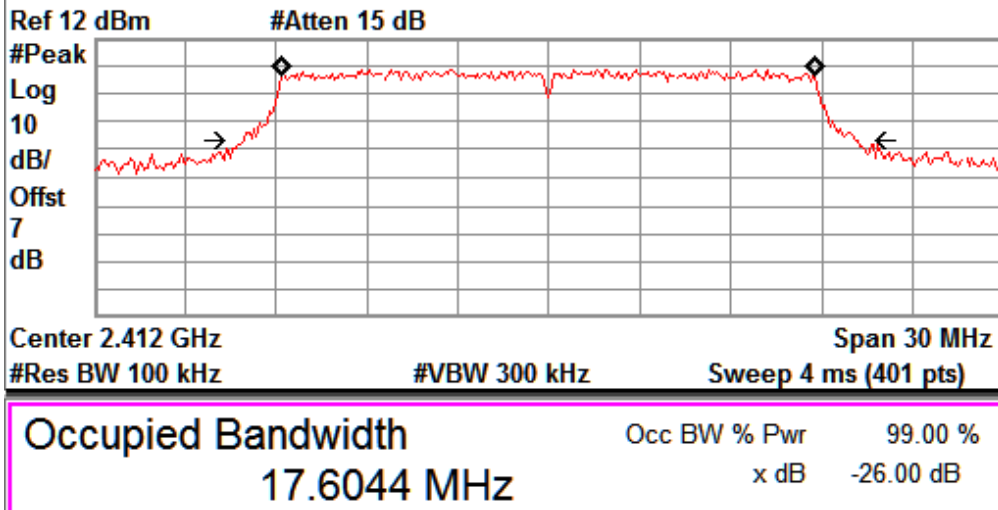
99% Occupied Bandwidth: Channel 2442MHz



Data Rate: 6.5 Mbps

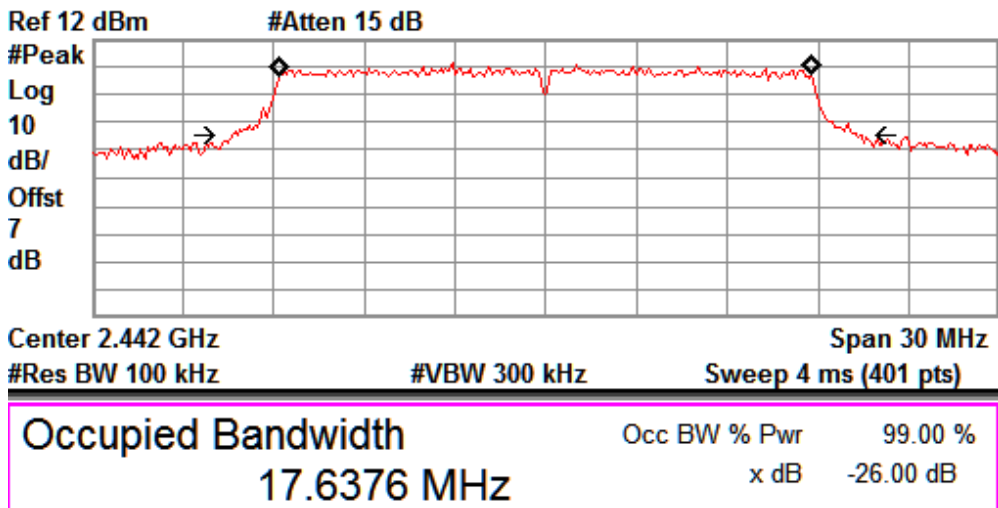
99% Occupied Bandwidth: Channel 2472MHz

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Data Rate: 39 Mbps

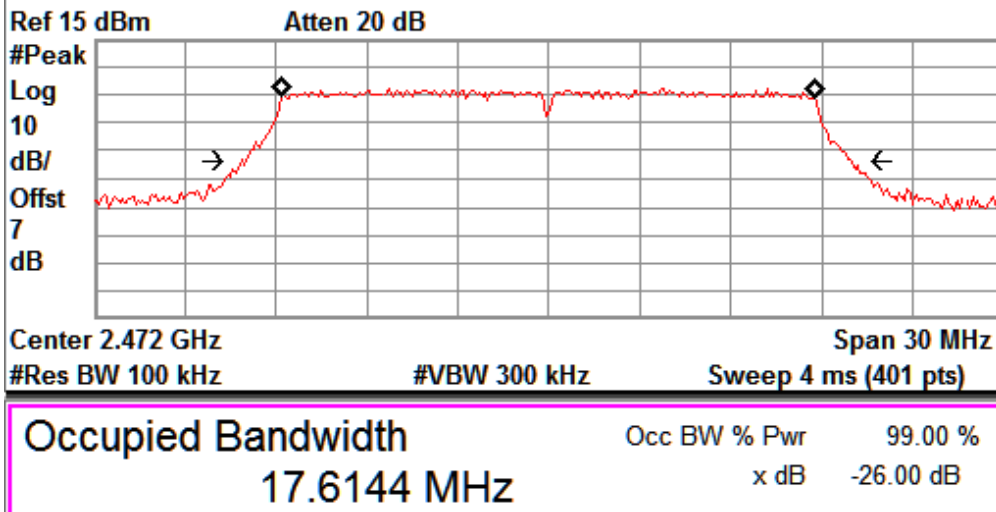
99% Occupied Bandwidth: Channel 2412MHz



Data Rate: 39 Mbps

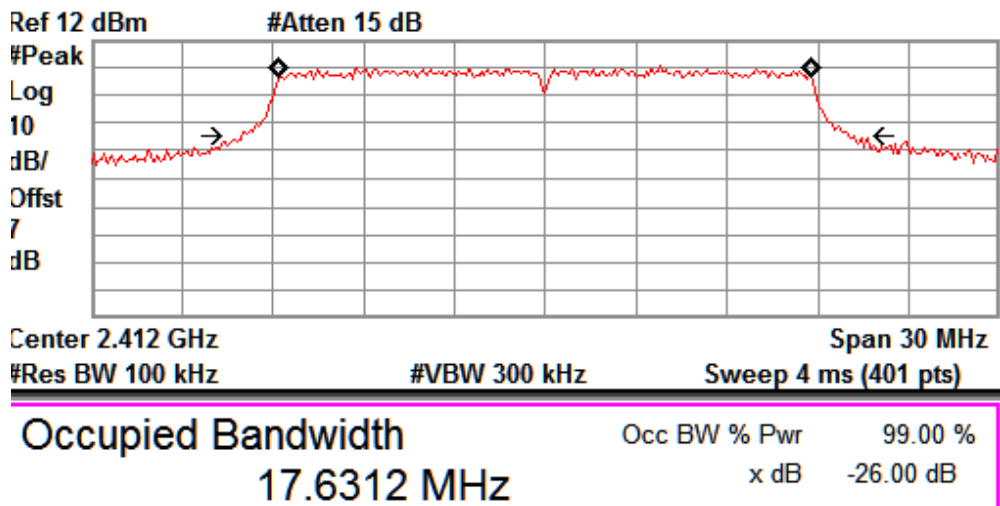
99% Occupied Bandwidth: Channel 2442MHz

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Data Rate: 39 Mbps

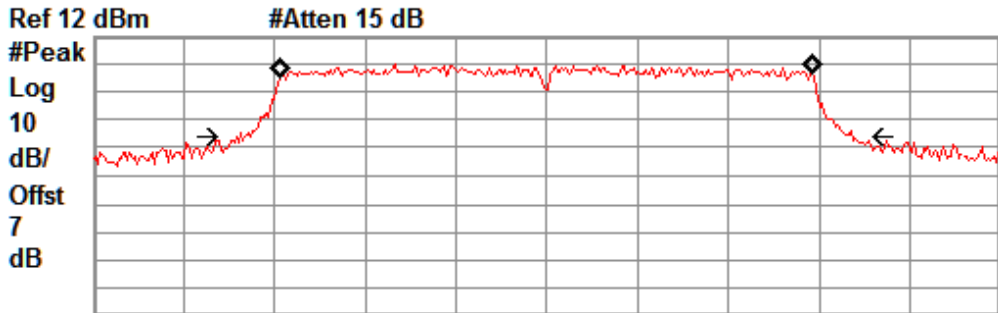
99% Occupied Bandwidth: Channel 2472MHz



Data Rate: 65 Mbps

99% Occupied Bandwidth: Channel 2412MHz

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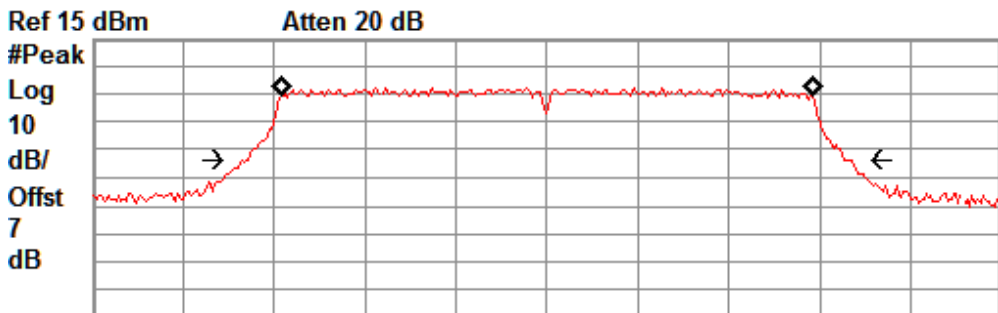


Center 2.442 GHz Span 30 MHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)

Occupied Bandwidth	Occ BW % Pwr	99.00 %
17.6312 MHz	x dB	-26.00 dB

Data Rate: 65 Mbps

99% Occupied Bandwidth: Channel 2442MHz



Center 2.472 GHz Span 30 MHz
 #Res BW 100 kHz #VBW 300 kHz Sweep 4 ms (401 pts)

Occupied Bandwidth	Occ BW % Pwr	99.00 %
17.5798 MHz	x dB	-26.00 dB

Data Rate: 65 Mbps

99% Occupied Bandwidth: Channel 2472MHz

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Band-edge Compliance

Section 15.247(d)

Result

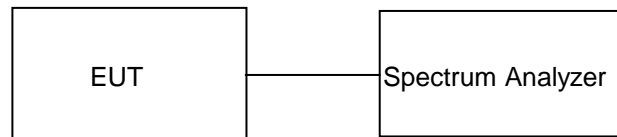
Pass

Test Specification
Detector Function
Requirement

FCC Part 15 Section 15.247(d)
Peak

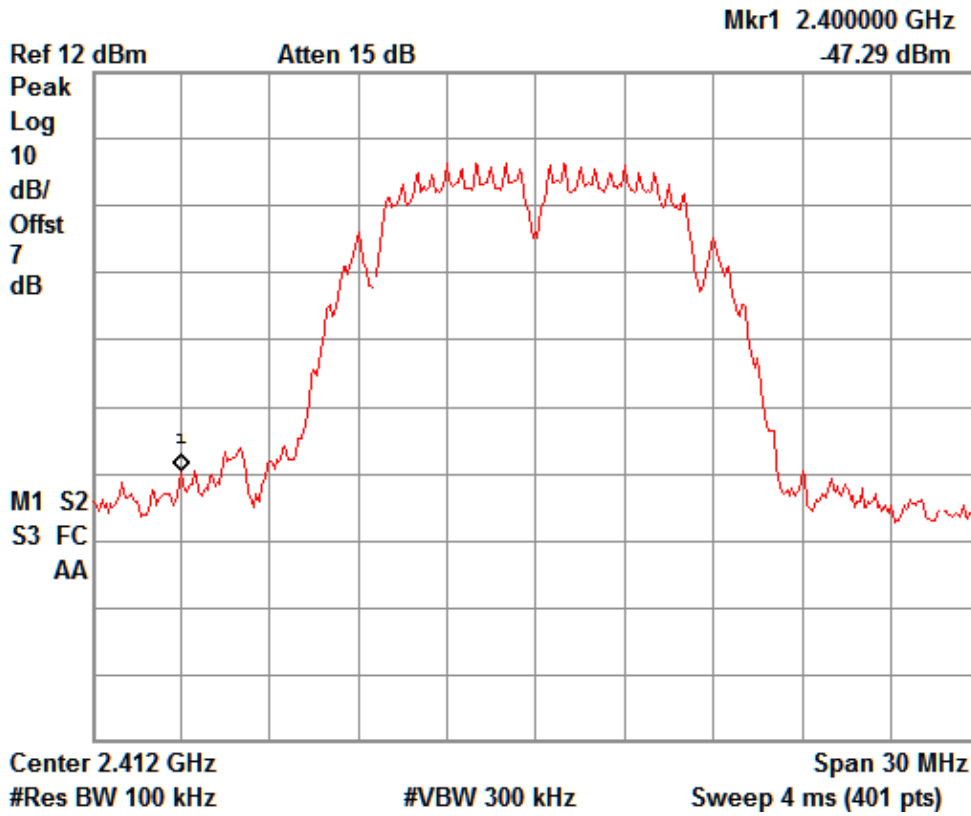
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the 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:



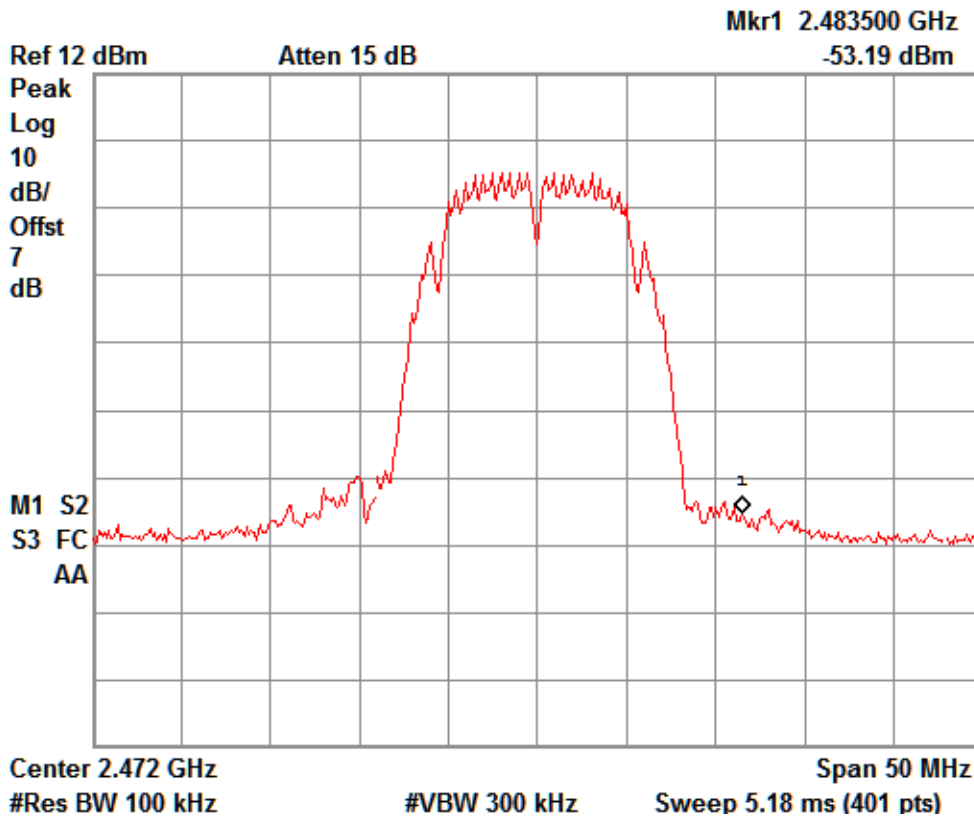
Test Result:

802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Value at Band Edge		Limit (dBc)
			Frequency (MHz)	Value (dBc)	
b	1	2412.00	2400.00	-45.36	-20.00
		2472.00	2483.50	-50.58	-20.00
	11	2412.00	2400.00	-37.79	-20.00
		2472.00	2483.50	-45.85	-20.00



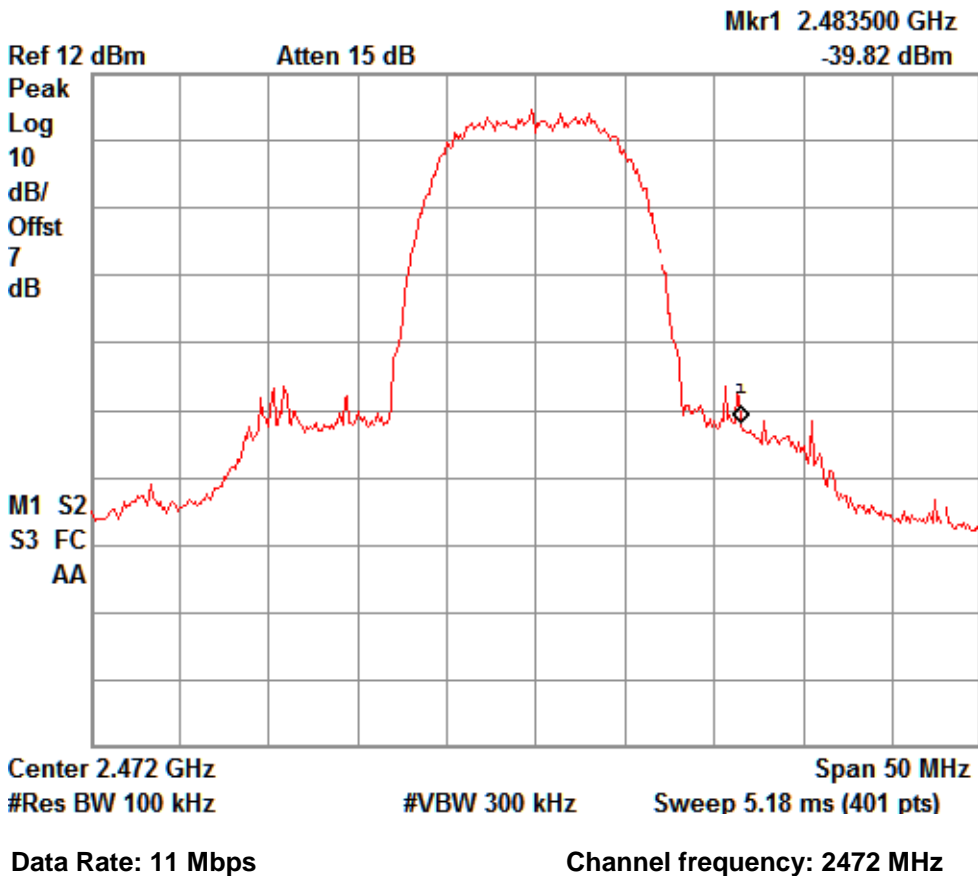
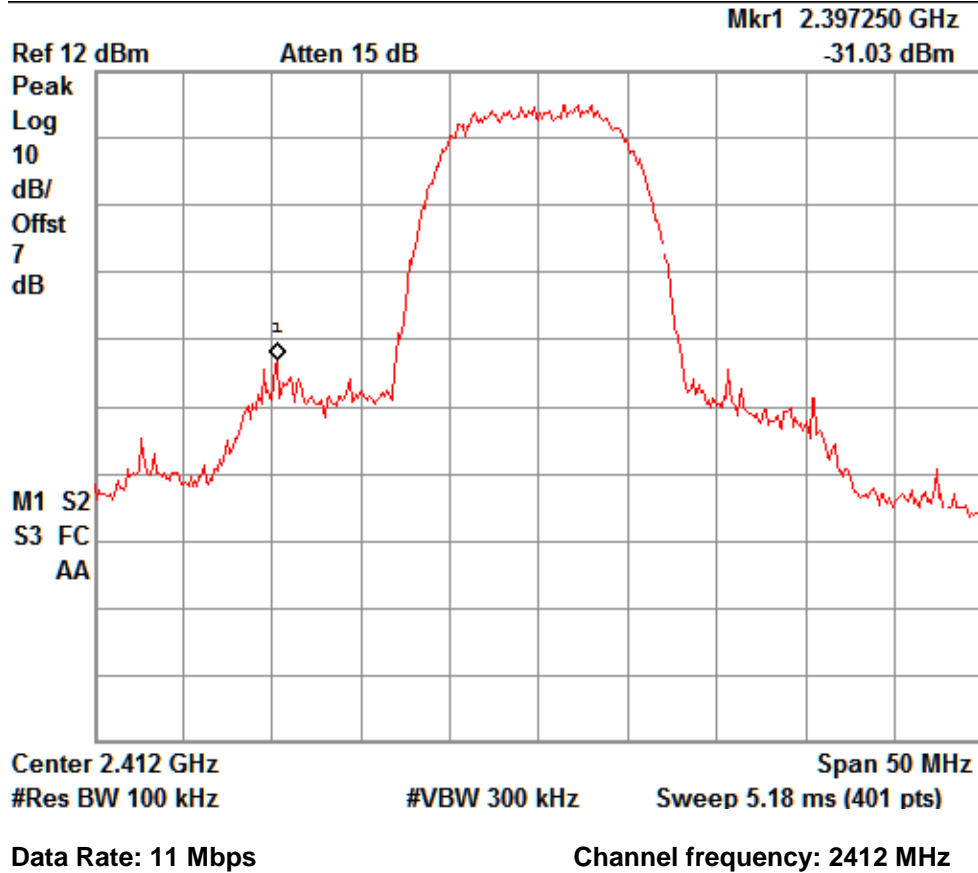
Data Rate: 1 Mbps

Channel frequency: 2412 MHz

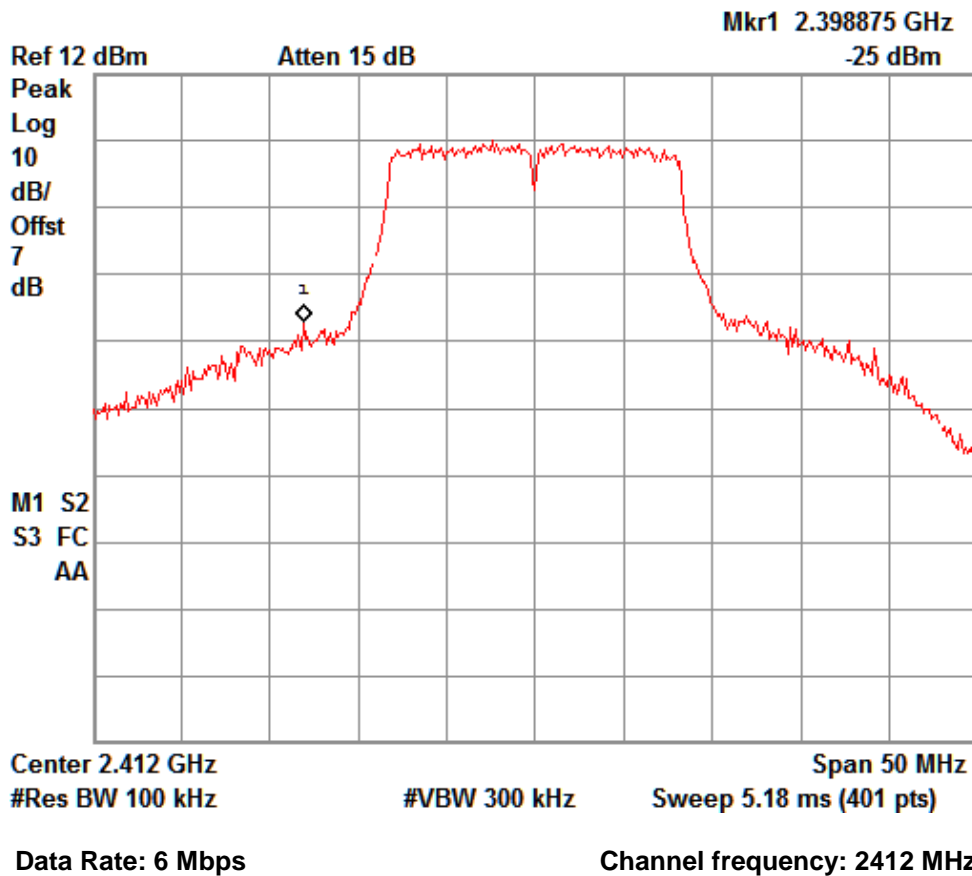


Data Rate: 1 Mbps

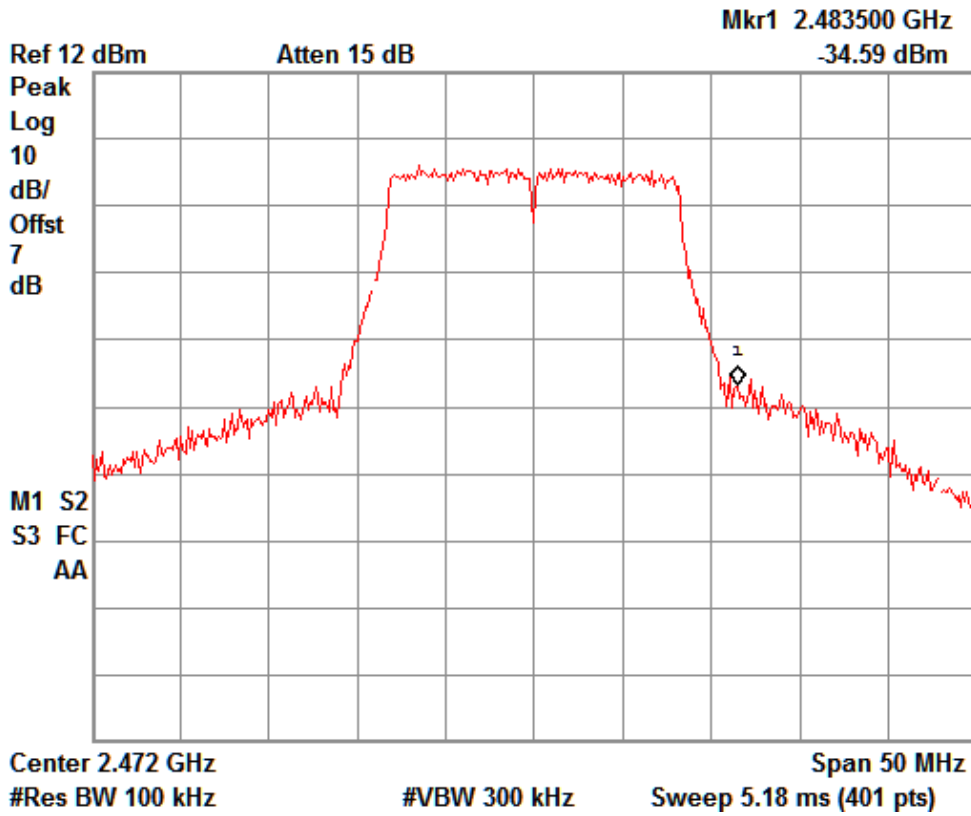
Channel frequency: 2472 MHz



802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Value at Bande Edge		Limit (dBc)
			Frequency (MHz)	Value (dBc)	
g	6	2412.00	2400.00	-26.37	-20.00
		2472.00	2483.50	-33.05	-20.00
	24	2412.00	2400.00	-29.02	-20.00
		2472.00	2483.50	-36.52	-20.00
	54	2412.00	2400.00	-29.31	-20.00
		2472.00	2483.50	-36.61	-20.00

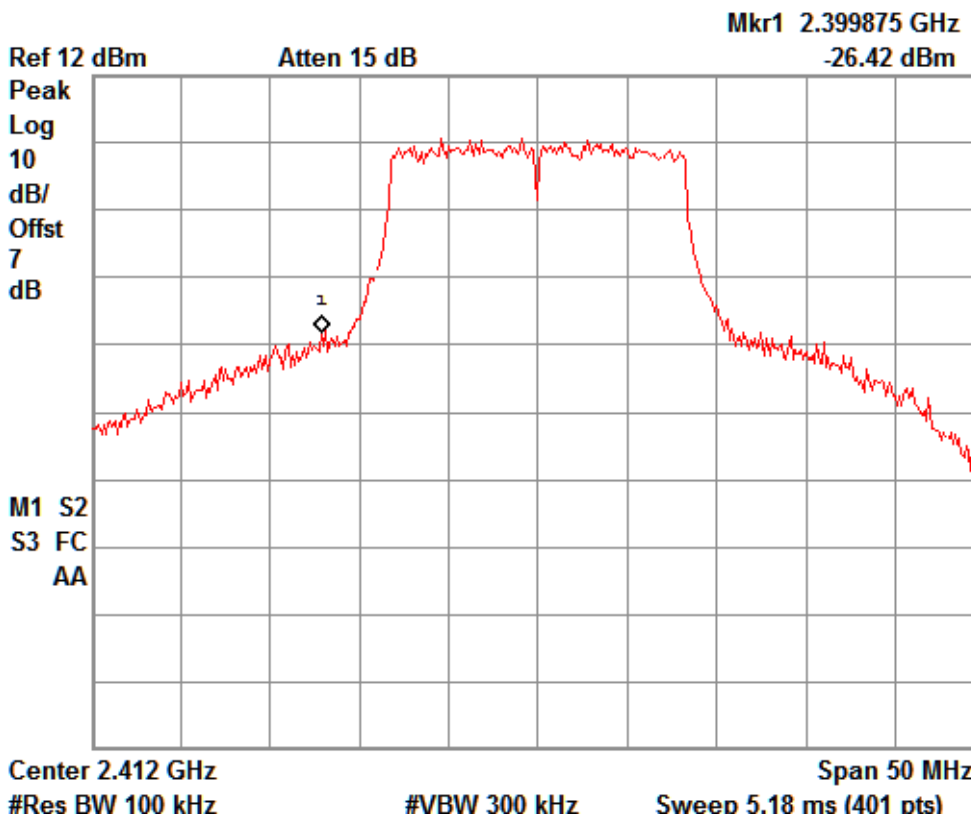


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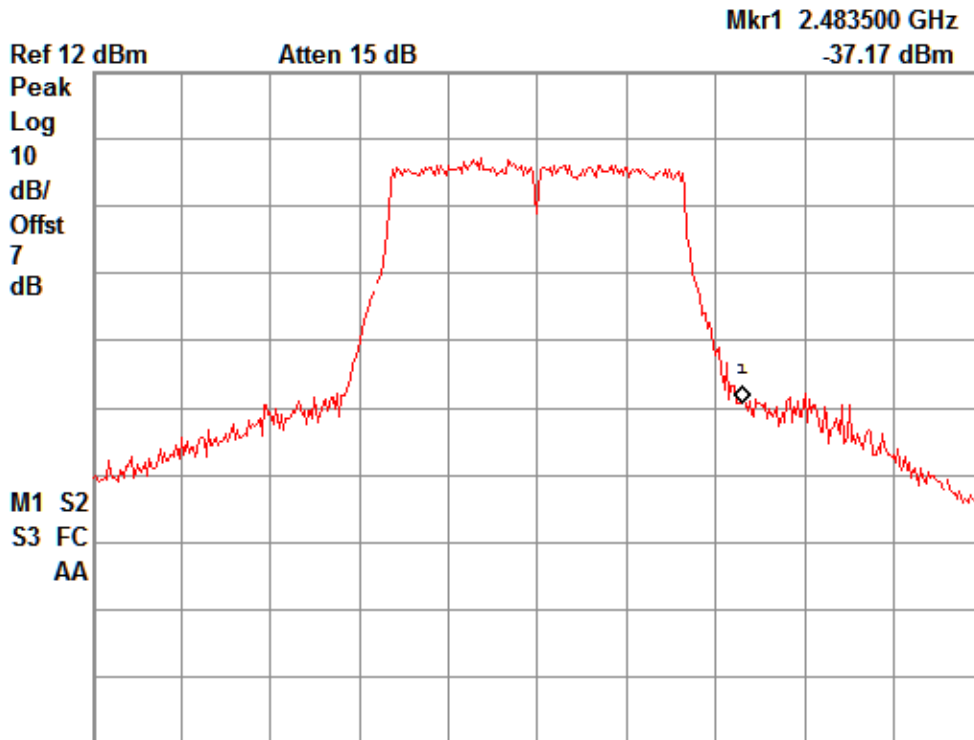
Data Rate: 6 Mbps

Channel frequency: 2472 MHz



Data Rate: 24 Mbps

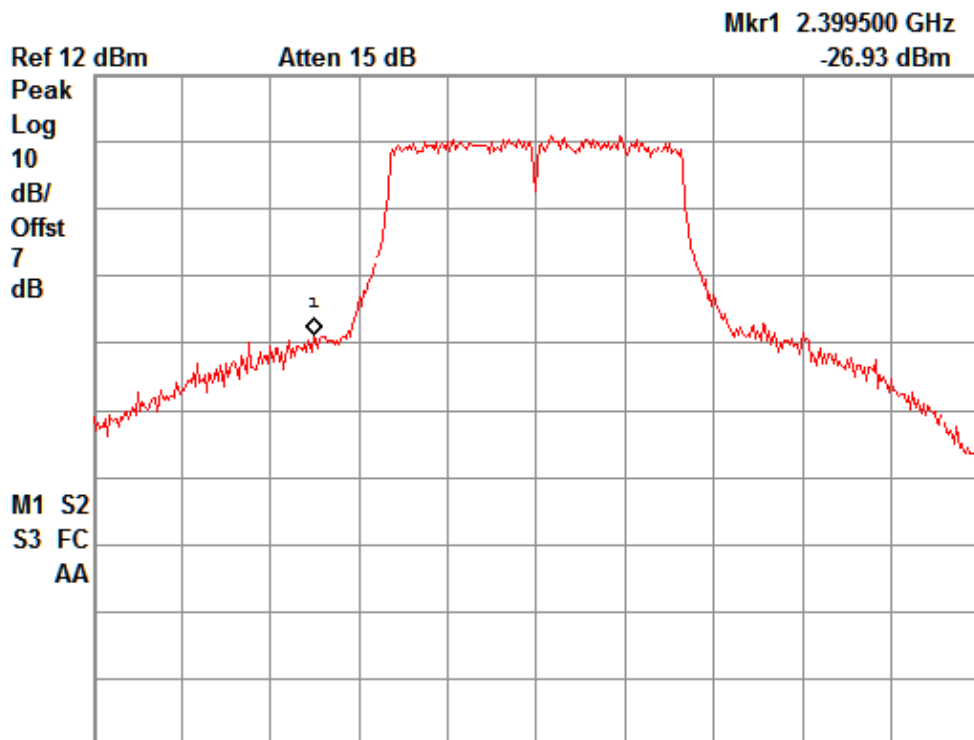
Channel frequency: 2412 MHz



Center 2.472 GHz Span 50 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)

Data Rate: 24 Mbps

Channel frequency: 2472 MHz

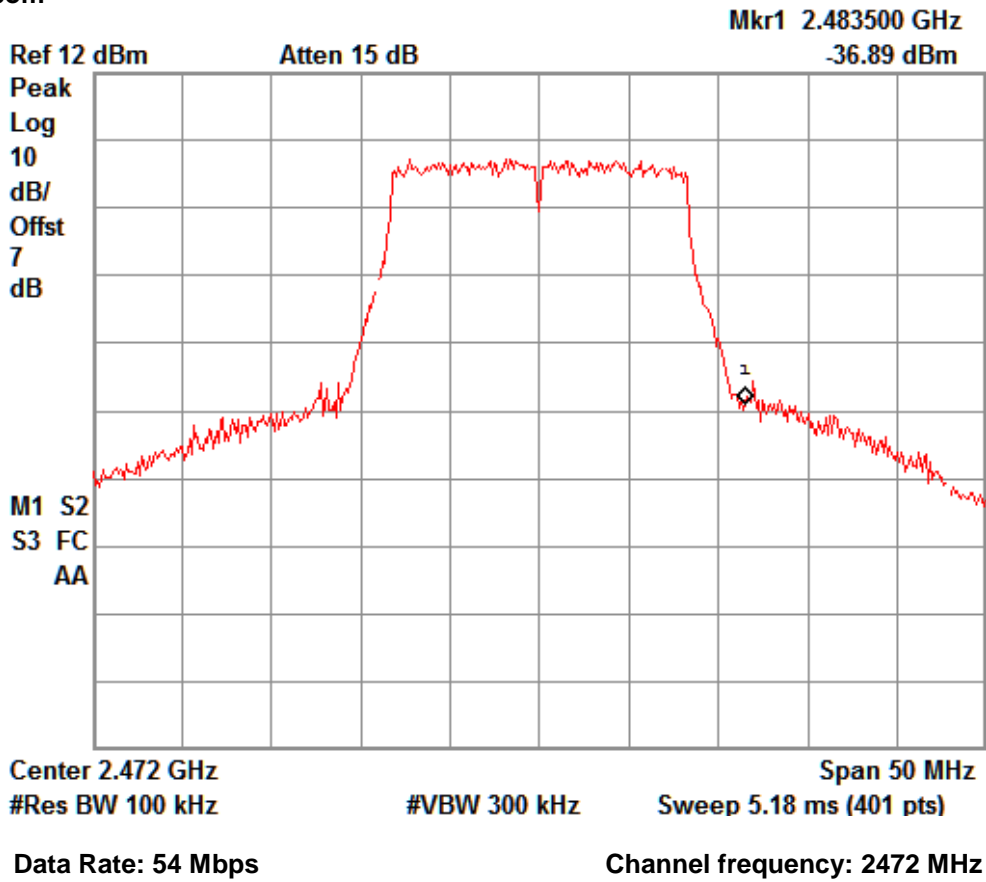


Center 2.412 GHz Span 50 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)

Data Rate: 54 Mbps

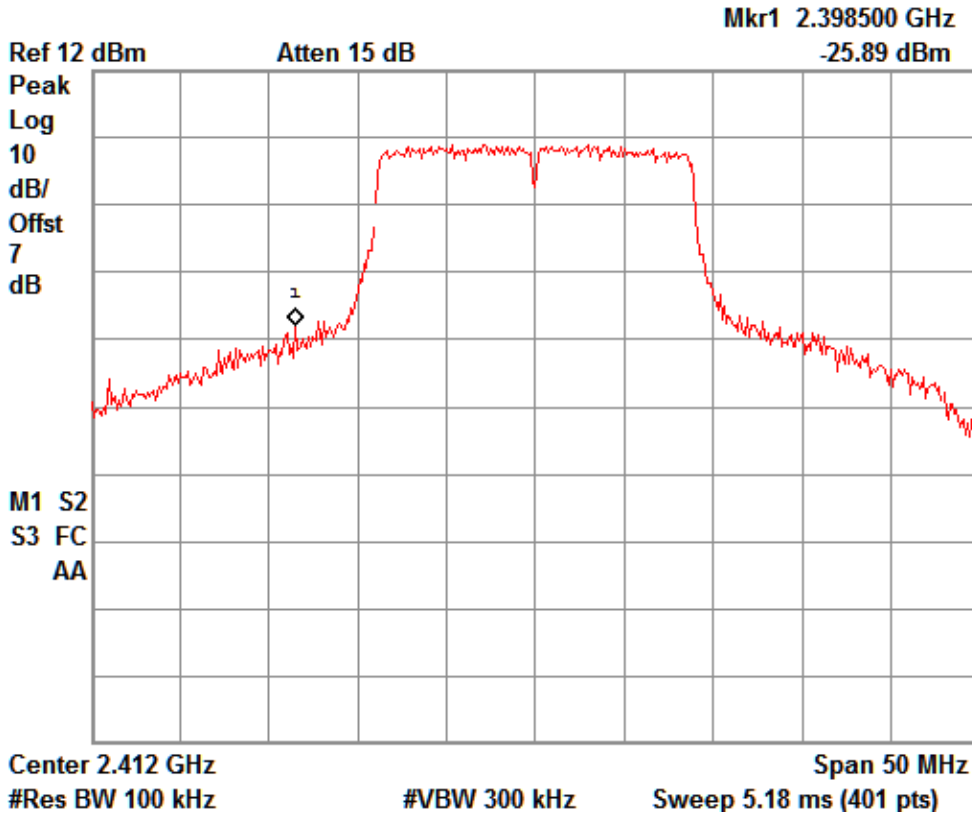
Channel frequency: 2412 MHz

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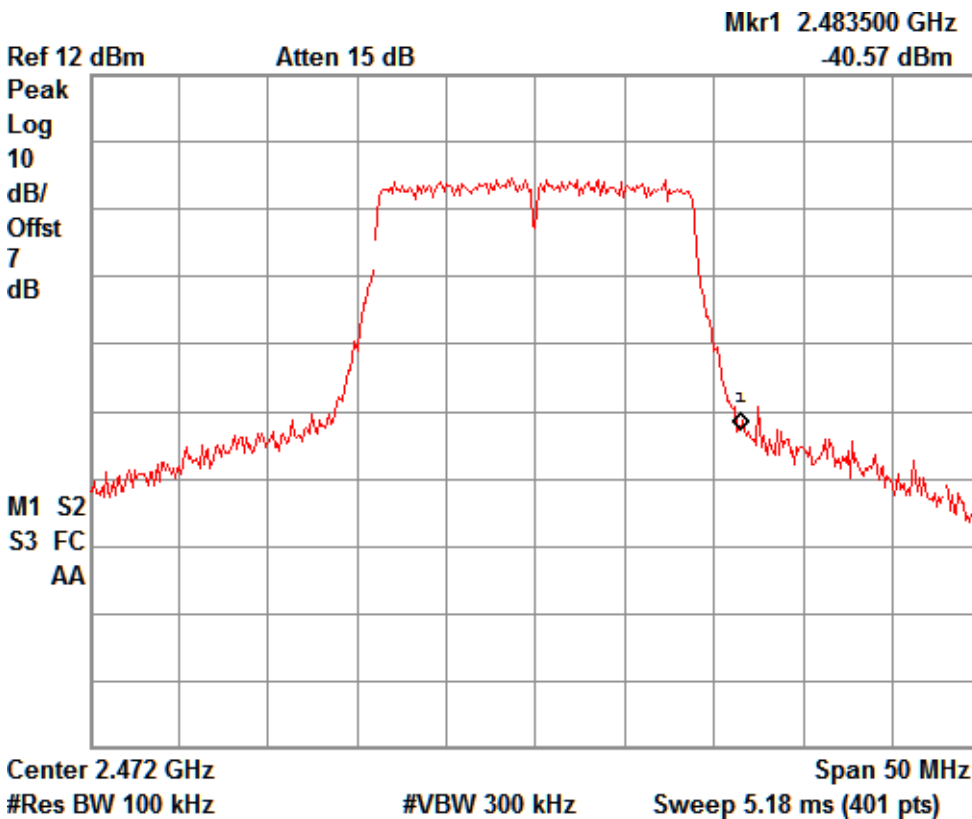
802.11 Protocol	Data Rate (Mbps)	Channel Frequency (MHz)	Value at Bande Edge		Limit (dBc)
			Frequency (MHz)	Value (dBc)	
n	6.5	2412.00	2400.00	-26.75	-20.00
		2472.00	2483.50	-37.87	-20.00
	39	2412.00	2400.00	-30.52	-20.00
		2472.00	2483.50	-34.80	-20.00
	65	2412.00	2400.00	-29.98	-20.00
		2472.00	2483.50	-34.76	-20.00

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Data Rate: 6.5 Mbps

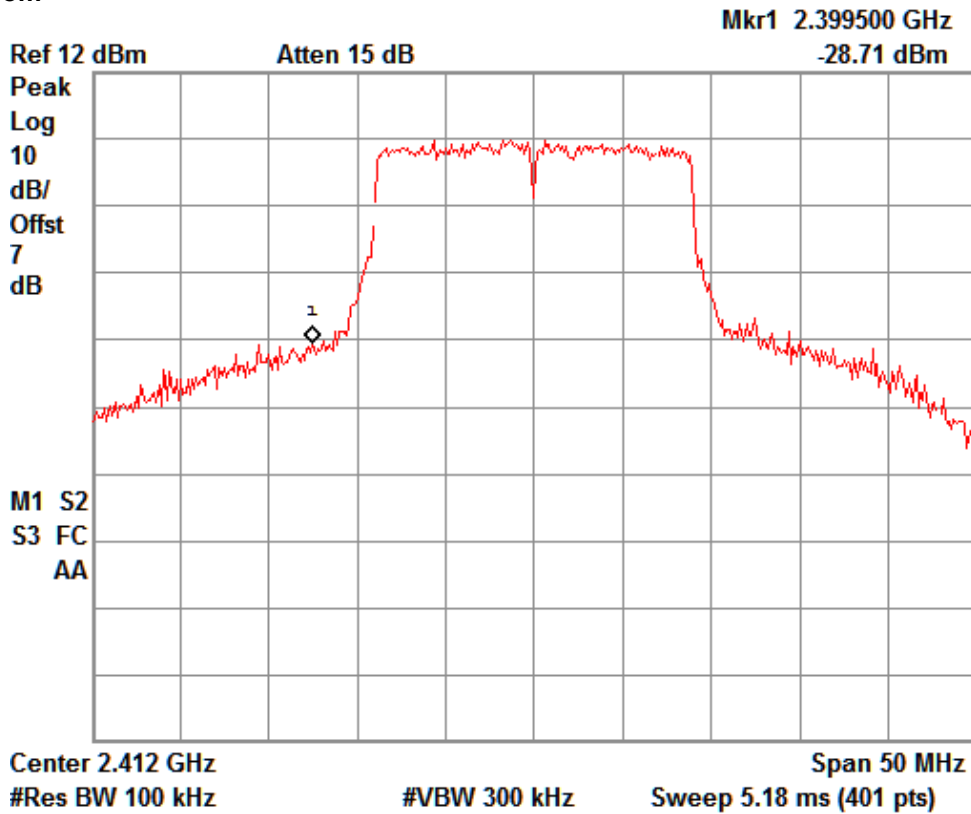
Channel frequency: 2412 MHz



Data Rate: 6.5 Mbps

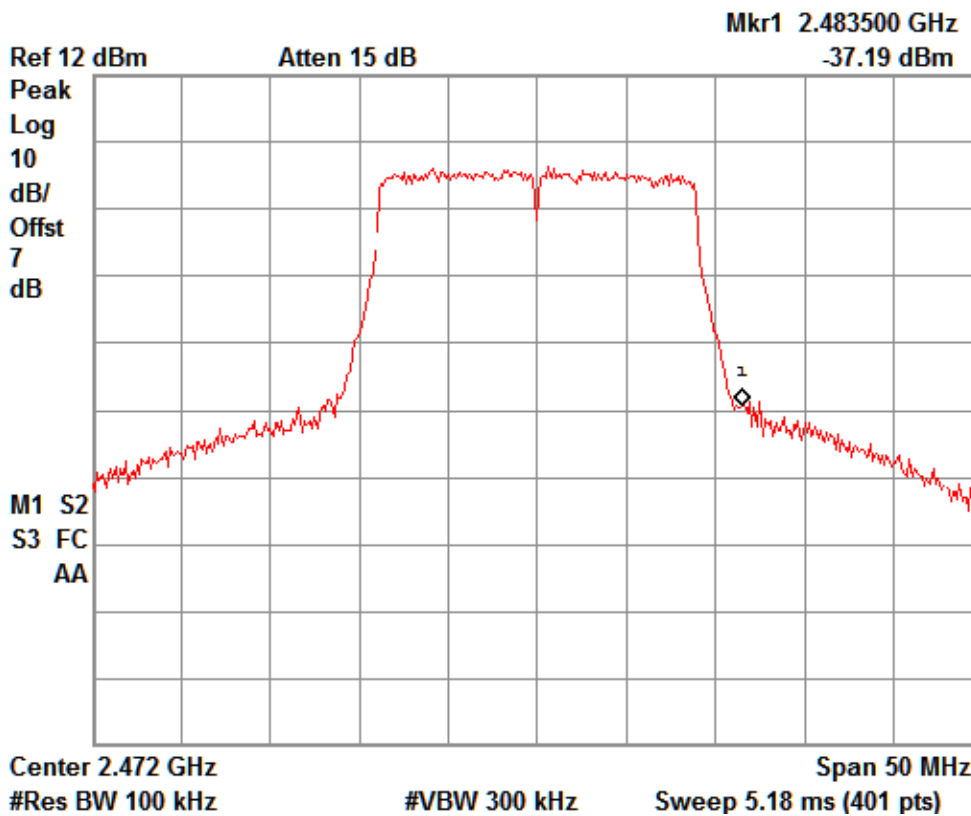
Channel frequency: 2472 MHz

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Data Rate: 39 Mbps

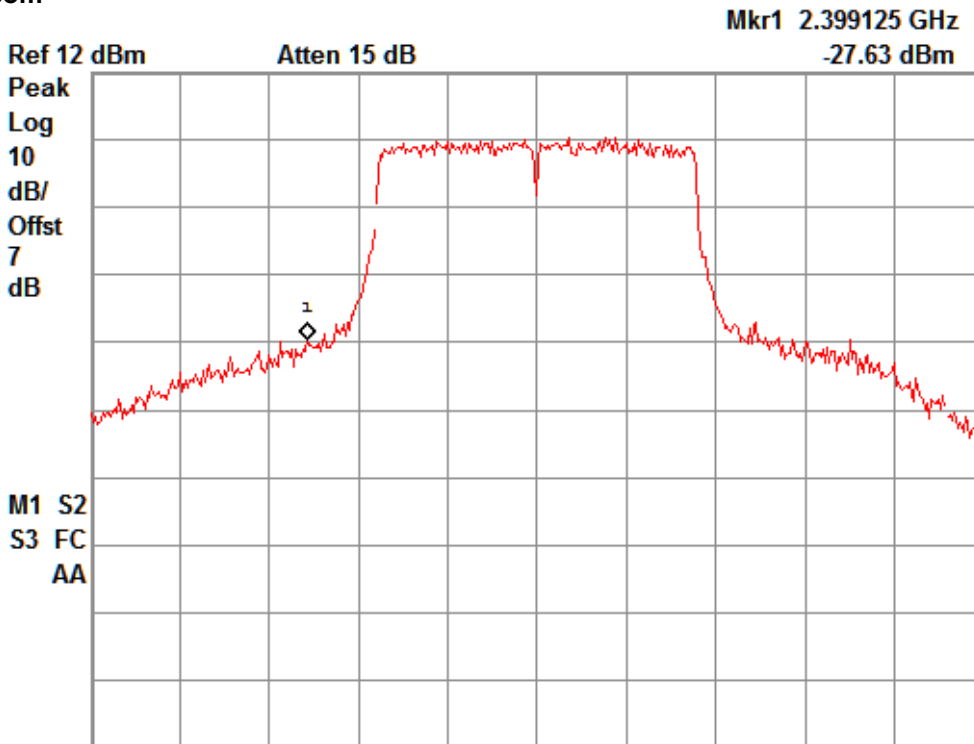
Channel frequency: 2412 MHz



Data Rate: 39 Mbps

Channel frequency: 2472 MHz

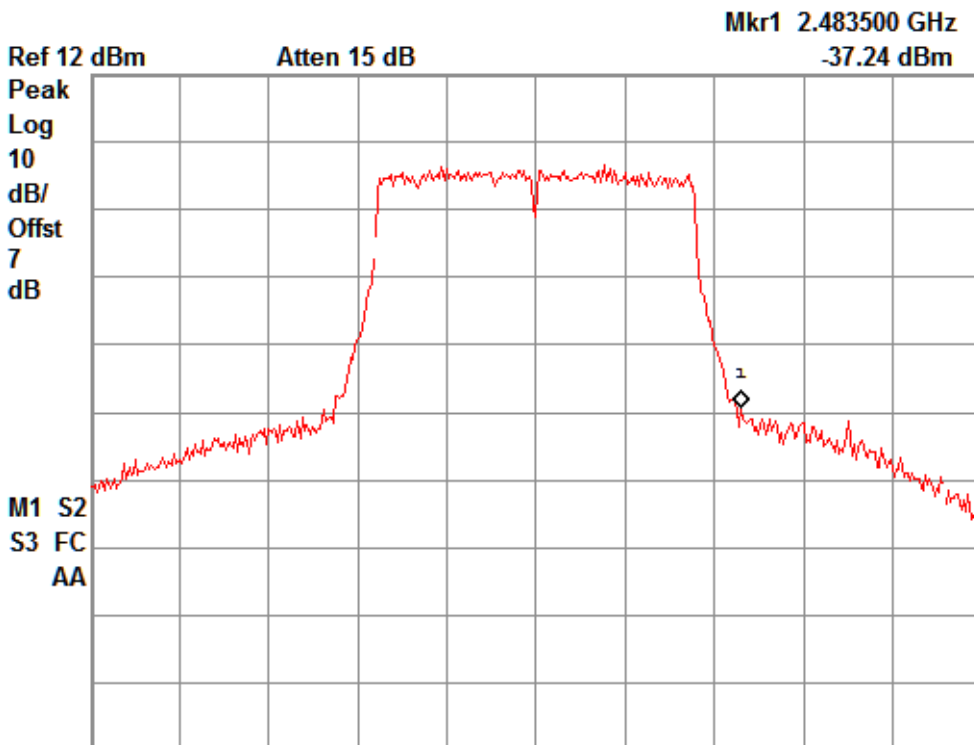
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Center 2.412 GHz Span 50 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)

Data Rate: 65 Mbps

Channel frequency: 2412 MHz



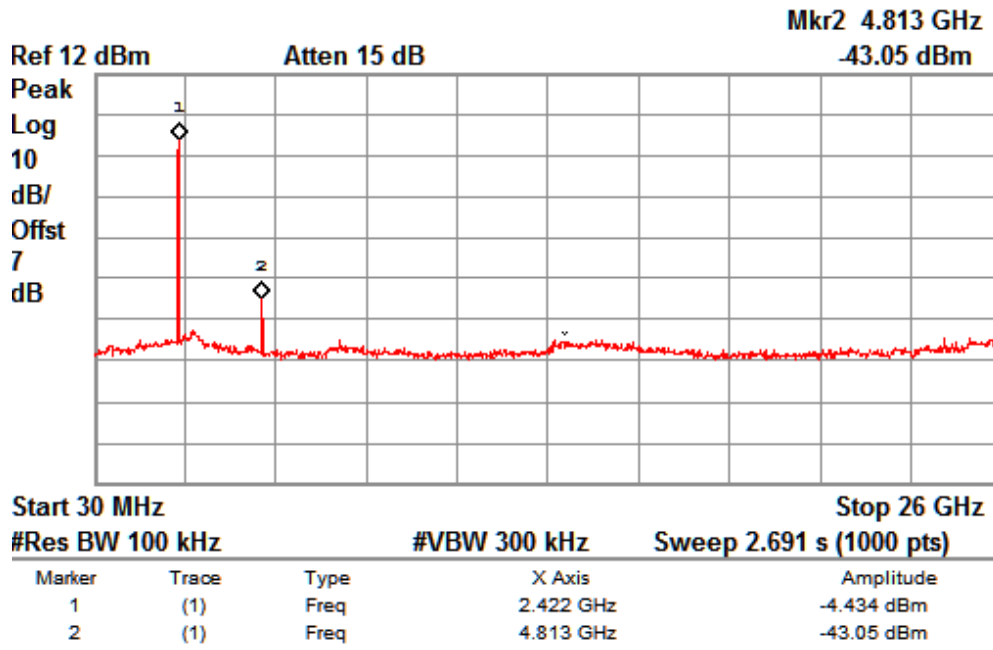
Center 2.472 GHz Span 50 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 5.18 ms (401 pts)

Data Rate: 65 Mbps

Channel frequency: 2472 MHz

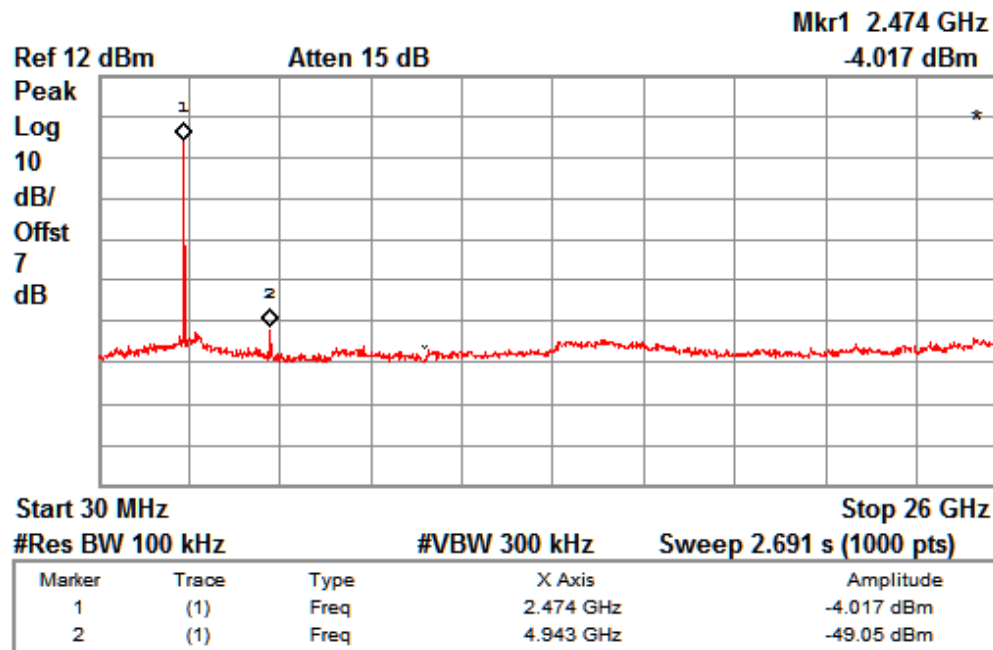
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Conducted Spurious Emission



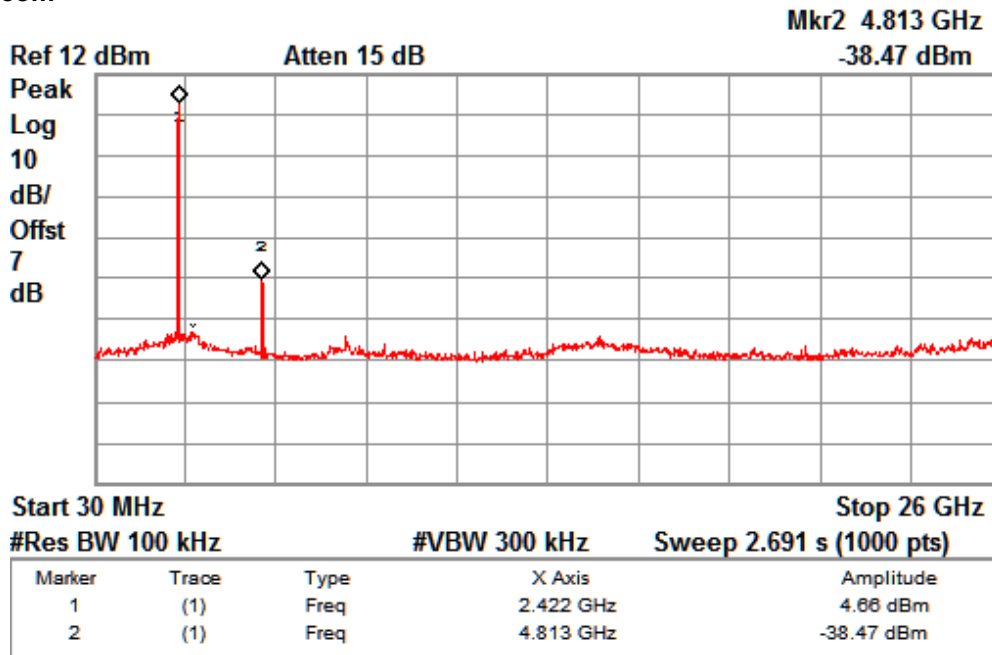
Data Rate: 1Mbps

Channel Low



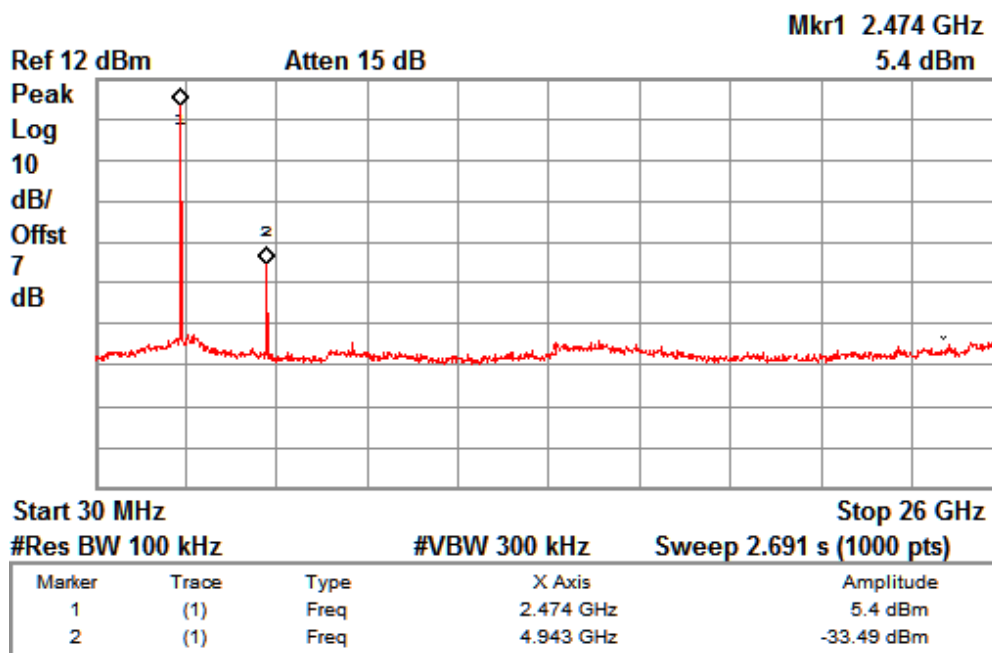
Data Rate: 1Mbps

Channel High



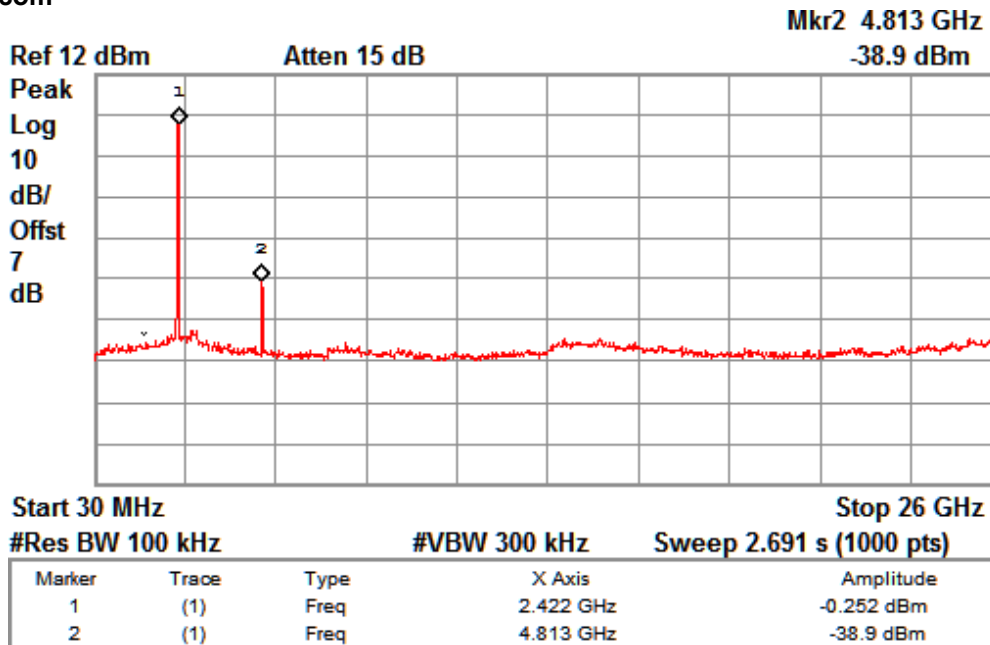
Data Rate: 11Mbps

Channel Low



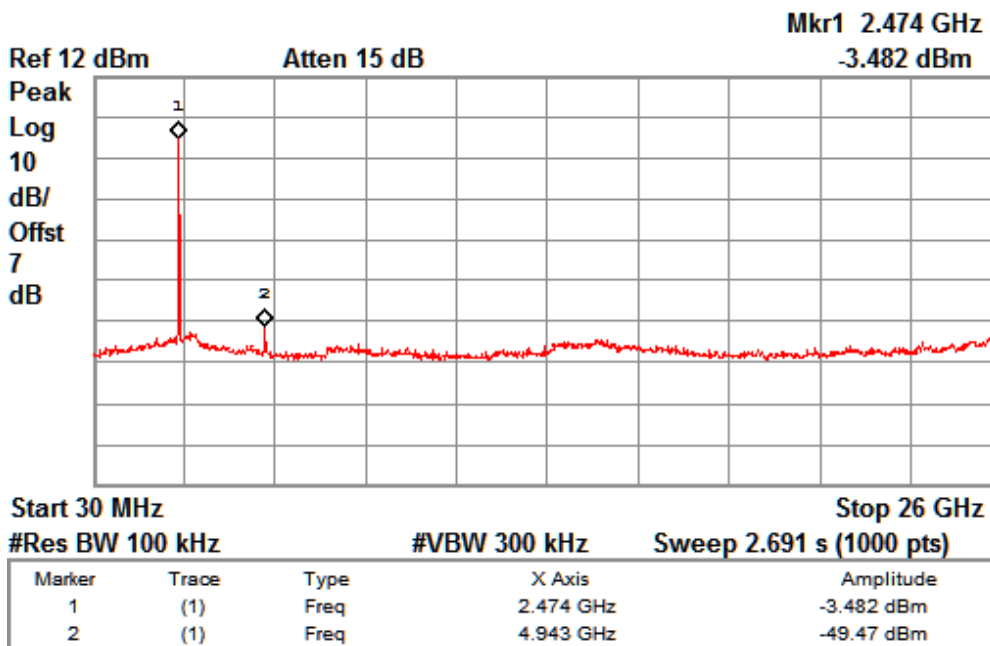
Data Rate: 11Mbps

Channel High



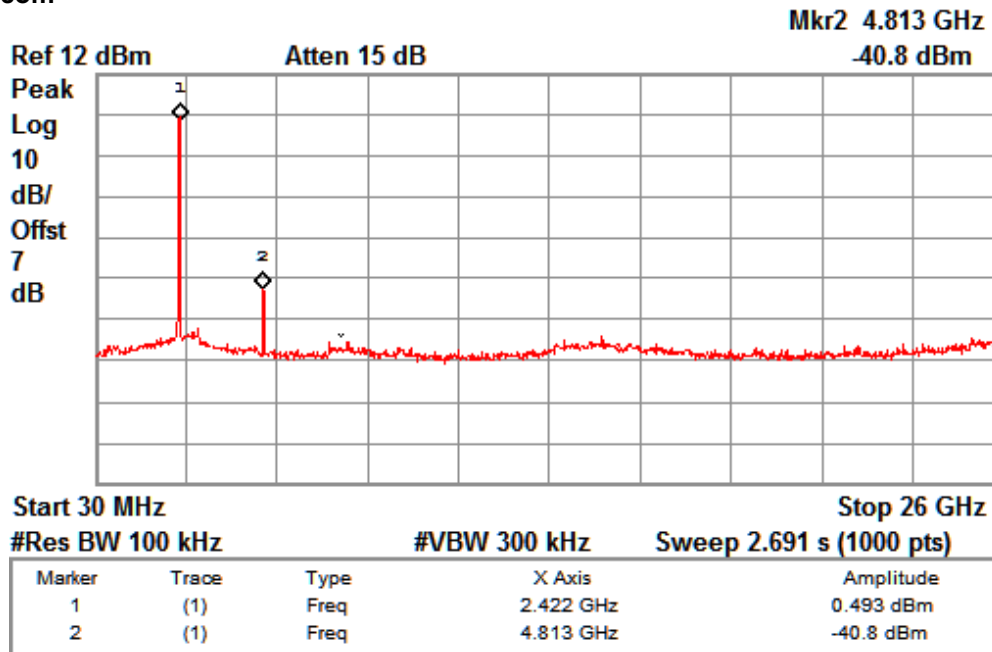
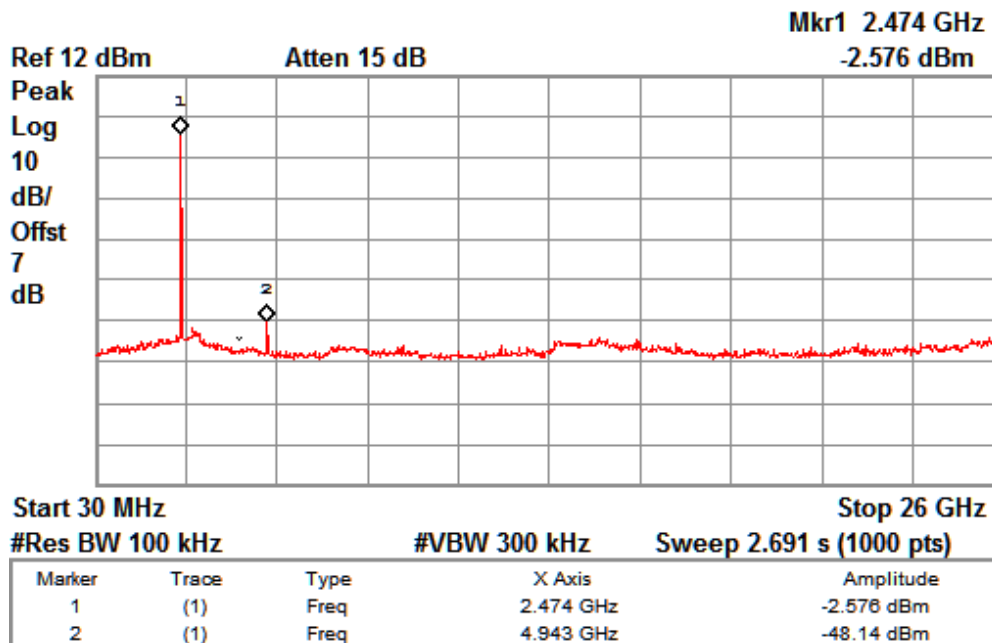
Data Rate: 6Mbps

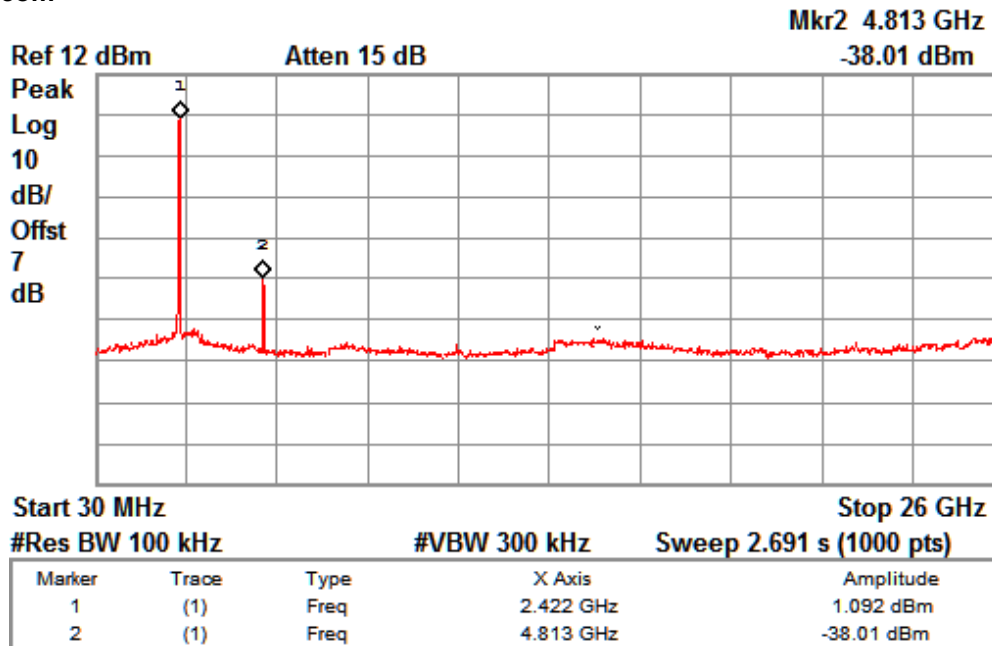
Channel Low



Data Rate: 6Mbps

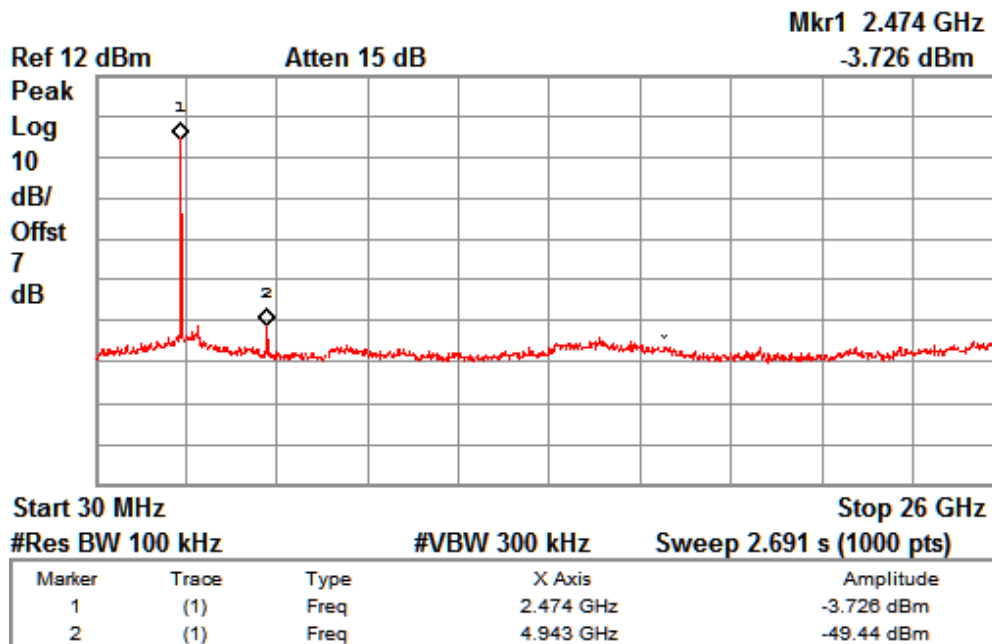
Channel High


Data Rate: 24Mbps
Channel Low

Data Rate: 24Mbps
Channel High



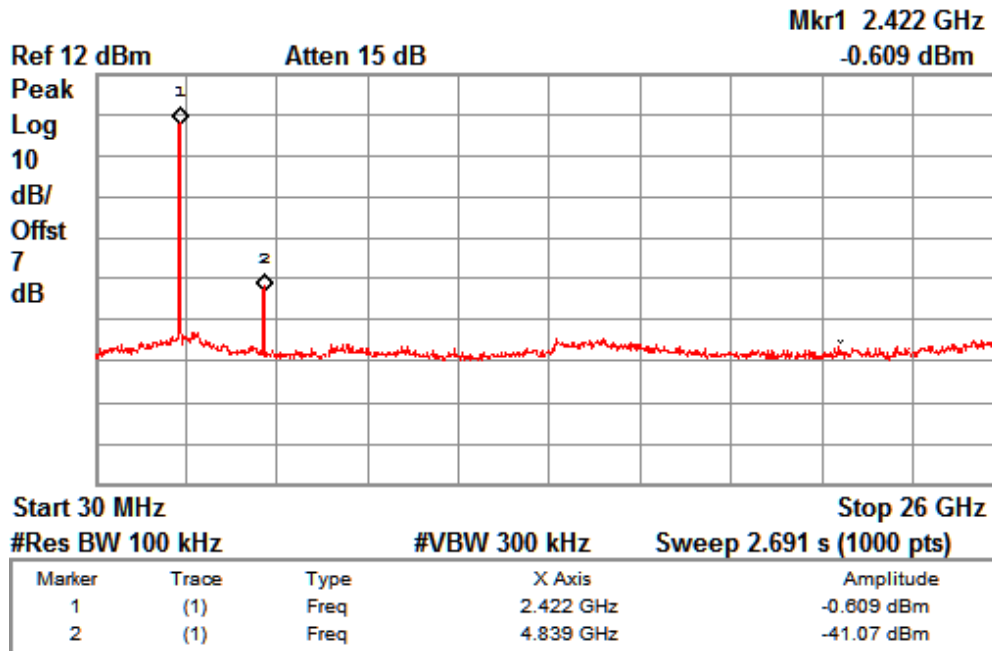
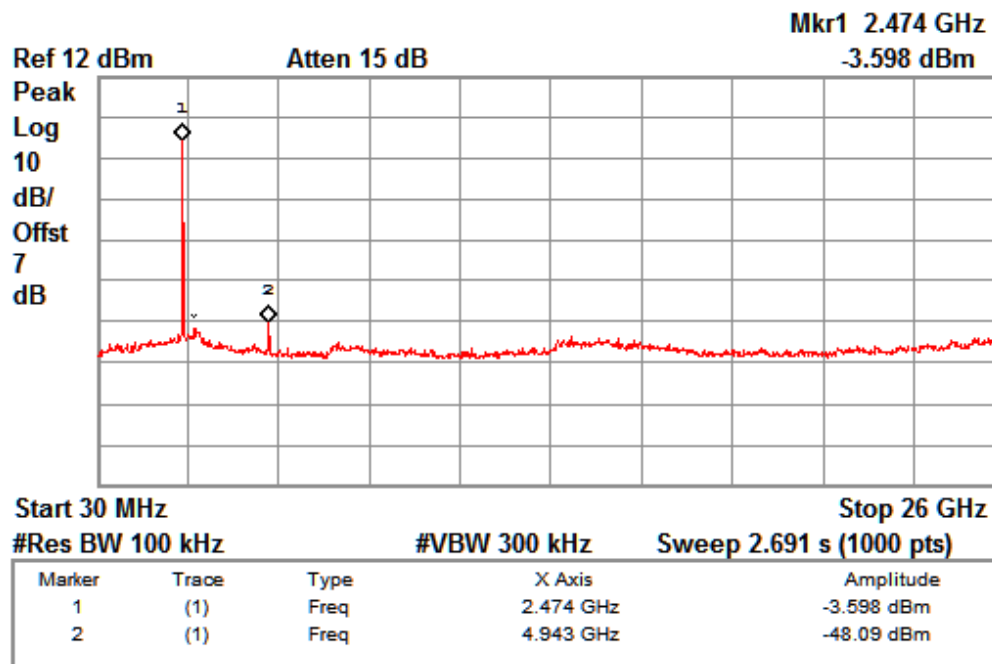
Data Rate: 54Mbps

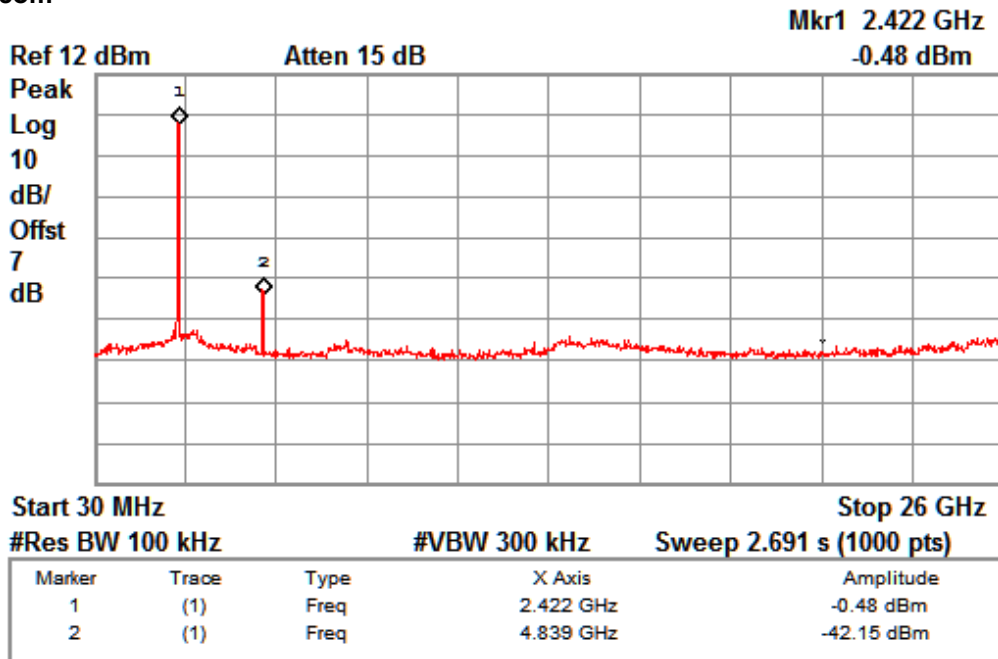
Channel Low



Data Rate: 54Mbps

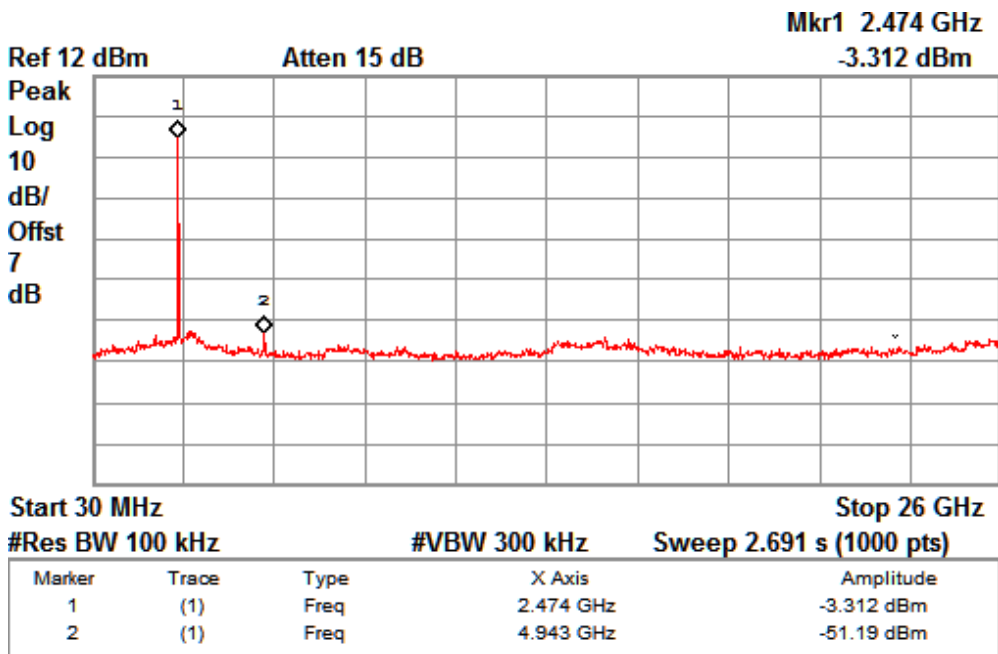
Channel High


Data Rate: 6.5 Mbps
Channel Low

Data Rate: 6.5 Mbps
Channel High



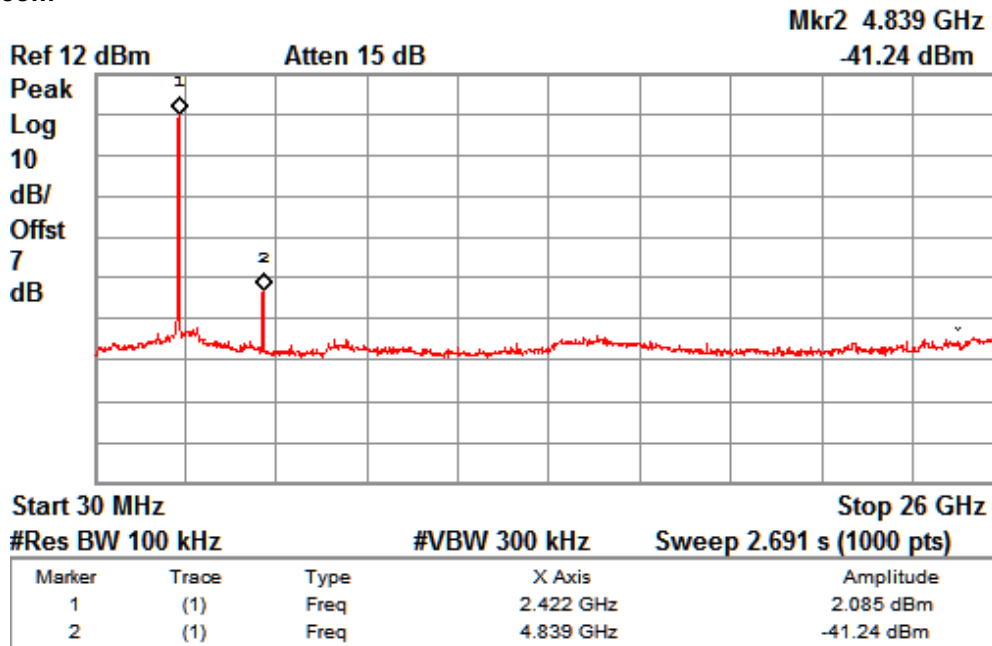
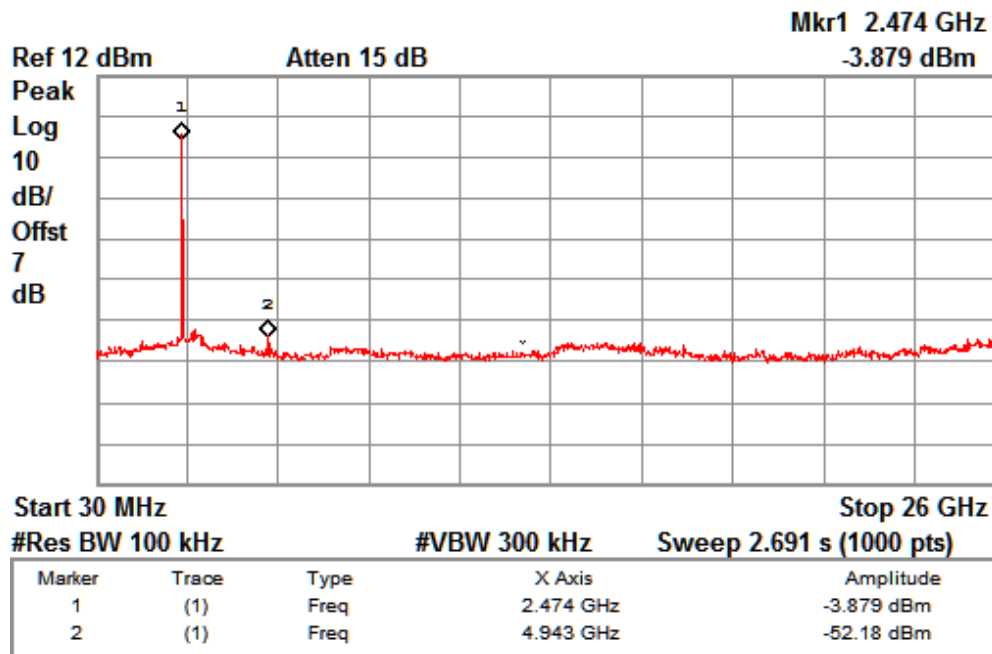
Data Rate: 39 Mbps

Channel Low



Data Rate: 39 Mbps

Channel High


Data Rate: 65 Mbps
Channel Low

Data Rate: 65 Mbps
Channel High

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

Section 15.209 and 15.205

Result

Pass

Test Specification	FCC Part 15 Section 15.209 &15.205
Test Method	ANSI C63.4-2003
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 bellow table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	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 49.5dB $\mu\text{V/m}$ 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.

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Test results:

For frequency Range 9kHz - 1 GHz

No emissions found in this frequency range.

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For frequency above 1GHz

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	Low	V	Pk	2390	54.33	74.00	-19.67
			Av	2390	50.63	54.00	-3.37
			Pk	2412	91.68	*	-
			Av	2412	88.71	*	-
			Pk	4824	55.49	74.00	-18.51
			Av	4824	51.13	54.00	-2.87
		H	Pk	2390	49.39	74.00	-24.61
			Av	2390	45.14	54.00	-8.86
			Pk	2412	84.6	*	-
			Av	2412	81.5	*	-
			Pk	4824	51.86	74.00	-22.14
			Av	4824	45.21	54.00	-8.79
	Mid	V	Pk	2442	91.54	*	-
			Av	2442	87.87	*	-
			Pk	4884	54.65	74.00	-19.35
			Av	4884	50.98	54.00	-3.02
		H	Pk	2442	84.35	*	-
			Av	2442	80.98	*	-
			Pk	4884	51.65	74.00	-22.35
			Av	4884	44.95	54.00	-9.05
	High	V	Pk	2472	89.27	*	-
			Av	2472	86.94	*	-
			Pk	2483.5	56.17	74.00	-17.83
			Av	2483.5	50.54	54.00	-3.46
Pk			4944	53.21	74.00	-20.79	
Av			4944	49.85	54.00	-4.15	
H		Pk	2472	74.72	*	-	
		Av	2472	72.26	*	-	
		Pk	2483.5	44.39	74.00	-29.61	
		Av	2483.5	36.71	54.00	-17.29	
		Pk	4944	50.78	74.00	-23.22	
		Av	4944	44.54	54.00	-9.46	

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11	Low	V	Pk	2390	56.68	74.00	-17.32
			Av	2390	44.84	54.00	-9.16
			Pk	2412	103.22	*	-
			Av	2412	95.75	*	-
			Pk	4824	65.61	74.00	-8.39
			Av	4824	53.2	54.00	-0.80
		H	Pk	2390	51.72	74.00	-22.28
			Av	2390	39.93	54.00	-14.07
			Pk	2412	96.76	*	-
			Av	2412	89.08	*	-
			Pk	4824	61.2	74.00	-12.80
			Av	4824	48.53	54.00	-5.47
	Mid	V	Pk	2442	103.01	*	-
			Av	2442	95.34	*	-
			Pk	4884	64.19	74.00	-9.81
			Av	4884	52.19	54.00	-1.81
		H	Pk	2442	96.12	*	-
			Av	2442	88.78	*	-
			Pk	4884	60.85	74.00	-13.15
			Av	4884	48.08	54.00	-5.92
	High	V	Pk	2472	102.87	*	-
			Av	2472	95.28	*	-
			Pk	2483.5	64.24	74.00	-9.76
			Av	2483.5	51	54.00	-3.00
			Pk	4944	63.83	74.00	-10.17
			Av	4944	52.05	54.00	-1.95
		H	Pk	2472	87.51	*	-
			Av	2472	79.74	*	-
			Pk	2483.5	48.46	74.00	-25.54
			Av	2483.5	35.81	54.00	-18.19
Pk			4944	60.19	74.00	-13.81	
Av			4944	47.76	54.00	-6.24	

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
6	Low	V	Pk	2390	65.15	74.00	-8.85
			Av	2390	51.19	54.00	-2.81
			Pk	2412	101.4	*	-
			Av	2412	92.51	*	-
			Pk	4824	64.19	74.00	-9.81
			Av	4824	51.22	54.00	-2.78
		H	Pk	2390	60.32	74.00	-13.68
			Av	2390	45.94	54.00	-8.06
			Pk	2412	94.81	*	-
			Av	2412	85.52	*	-
			Pk	4824	59.44	74.00	-14.56
			Av	4824	46.4	54.00	-7.60
	Mid	V	Pk	2442	102.45	*	-
			Av	2442	93.41	*	-
			Pk	4884	61.11	74.00	-12.89
			Av	4884	47.9	54.00	-6.10
		H	Pk	2442	96.04	*	-
			Av	2442	86.31	*	-
			Pk	4884	60.44	74.00	-13.56
			Av	4884	47.83	54.00	-6.17
	High	V	Pk	2472	99.24	*	-
			Av	2472	90.48	*	-
			Pk	2483.5	72.15	74.00	-1.85
			Av	2483.5	52.6	54.00	-1.40
			Pk	4944	58.14	74.00	-15.86
			Av	4944	42.89	54.00	-11.11
		H	Pk	2472	84.06	*	-
			Av	2472	75.68	*	-
			Pk	2483.5	59.23	74.00	-14.77
			Av	2483.5	38	54.00	-16.00
			Pk	4944	56.23	74.00	-17.77
			Av	4944	43.59	54.00	-10.41

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
24	Low	V	Pk	2390	65.58	74.00	-8.42
			Av	2390	51.58	54.00	-2.42
			Pk	2412	103.21	*	-
			Av	2412	92.66	*	-
			Pk	4824	62.34	74.00	-11.66
			Av	4824	50.78	54.00	-3.22
		H	Pk	2390	58.91	74.00	-15.09
			Av	2390	45.92	54.00	-8.08
			Pk	2412	96.24	*	-
			Av	2412	85.37	*	-
			Pk	4824	58.22	74.00	-15.78
			Av	4824	45.95	54.00	-8.05
	Mid	V	Pk	2442	101.23	*	-
			Av	2442	92.56	*	-
			Pk	4884	60.05	74.00	-13.95
			Av	4884	46.58	54.00	-7.42
		H	Pk	2442	95.25	*	-
			Av	2442	85.23	*	-
			Pk	4884	59.24	74.00	-14.76
			Av	4884	46.78	54.00	-7.22
	High	V	Pk	2472	100.81	*	-
			Av	2472	90.37	*	-
			Pk	2483.5	71.62	74.00	-2.38
			Av	2483.5	52.34	54.00	-1.66
			Pk	4944	57.22	74.00	-16.78
			Av	4944	42.67	54.00	-11.33
		H	Pk	2472	85.41	*	-
			Av	2472	75.07	*	-
			Pk	2483.5	56.86	74.00	-17.14
			Av	2483.5	37.6	54.00	-16.40
Pk			4944	55.45	74.00	-18.55	
Av			4944	42.19	54.00	-11.81	

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
54	Low	V	Pk	2390	65.4	74.00	-8.60
			Av	2390	51.32	54.00	-2.68
			Pk	2412	102.87	*	-
			Av	2412	92.73	*	-
			Pk	4824	62.96	74.00	-11.04
			Av	4824	50.83	54.00	-3.17
		H	Pk	2390	60.09	74.00	-13.91
			Av	2390	46.19	54.00	-7.81
			Pk	2412	96.07	*	-
			Av	2412	85.85	*	-
			Pk	4824	58.02	74.00	-15.98
			Av	4824	46.01	54.00	-7.99
	Mid	V	Pk	2442	100.98	*	-
			Av	2442	91.19	*	-
			Pk	4884	59.12	74.00	-14.88
			Av	4884	46.95	54.00	-7.05
		H	Pk	2442	94.97	*	-
			Av	2442	84.87	*	-
			Pk	4884	58.19	74.00	-15.81
			Av	4884	46.23	54.00	-7.77
	High	V	Pk	2472	101.07	*	-
			Av	2472	90.51	*	-
			Pk	2483.5	70.27	74.00	-3.73
			Av	2483.5	52.31	54.00	-1.69
			Pk	4944	56.64	74.00	-17.36
			Av	4944	41.4	54.00	-12.60
		H	Pk	2472	86.17	*	-
			Av	2472	75.7	*	-
			Pk	2483.5	55.16	74.00	-18.84
			Av	2483.5	37.81	54.00	-16.19
			Pk	4944	54.23	74.00	-19.77
			Av	4944	41.82	54.00	-12.18

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
MCS0	Low	V	Pk	2390	69.29	74.00	-4.71
			Av	2390	53.16	54.00	-0.84
			Pk	2412	102.1	*	-
			Av	2412	92.44	*	-
			Pk	4824	64.12	74.00	-9.88
			Av	4824	51.91	54.00	-2.09
		H	Pk	2390	63.74	74.00	-10.26
			Av	2390	47.85	54.00	-6.15
			Pk	2412	94.91	*	-
			Av	2412	85.71	*	-
			Pk	4824	59.21	74.00	-14.79
			Av	4824	47.21	54.00	-6.79
	Mid	V	Pk	2442	104.21	*	-
			Av	2442	94.58	*	-
			Pk	4884	60.98	74.00	-13.02
			Av	4884	48.21	54.00	-5.79
		H	Pk	2442	96.28	*	-
			Av	2442	87.19	*	-
			Pk	4884	61.09	74.00	-12.91
			Av	4884	48.21	54.00	-5.79
	High	V	Pk	2472	98.85	*	-
			Av	2472	89.25	*	-
			Pk	2483.5	73.65	74.00	-0.35
			Av	2483.5	51.46	54.00	-2.54
			Pk	4944	58.21	74.00	-15.79
			Av	4944	42.94	54.00	-11.06
		H	Pk	2472	83.66	*	-
			Av	2472	74.59	*	-
			Pk	2483.5	60.72	74.00	-13.28
			Av	2483.5	37.81	54.00	-16.19
Pk			4944	56.78	74.00	-17.22	
Av			4944	43.98	54.00	-10.02	

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)
MCS4	Low	V	Pk	2390	65.46	74.00	-8.54
			Av	2390	52.78	54.00	-1.22
			Pk	2412	102.35	*	-
			Av	2412	92.58	*	-
			Pk	4824	63.14	74.00	-10.86
			Av	4824	50.87	54.00	-3.13
		H	Pk	2390	60.22	74.00	-13.78
			Av	2390	47.01	54.00	-6.99
			Pk	2412	95.65	*	-
			Av	2412	85.21	*	-
			Pk	4824	58.45	74.00	-15.55
			Av	4824	46.54	54.00	-7.46
	Mid	V	Pk	2442	103.52	*	-
			Av	2442	94.01	*	-
			Pk	4884	59.68	74.00	-14.32
			Av	4884	47.43	54.00	-6.57
		H	Pk	2442	95.21	*	-
			Av	2442	87.44	*	-
			Pk	4884	60.98	74.00	-13.02
			Av	4884	48.22	54.00	-5.78
	High	V	Pk	2472	100	*	-
			Av	2472	89.48	*	-
			Pk	2483.5	71.22	74.00	-2.78
			Av	2483.5	51.18	54.00	-2.82
			Pk	4944	57.33	74.00	-16.67
			Av	4944	41.95	54.00	-12.05
		H	Pk	2472	85	*	-
			Av	2472	74.54	*	-
			Pk	2483.5	57.28	74.00	-16.72
			Av	2483.5	38.14	54.00	-15.86
Pk			4944	55.98	74.00	-18.02	
Av			4944	43.09	54.00	-10.91	

Data Rate (Mbps)	Channel	Polarization	Detector	Frequency (MHz)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)		
MCS7	Low	V	Pk	2390	64.88	74.00	-9.12		
			Av	2390	52.58	54.00	-1.42		
			Pk	2412	102.48	*	-		
			Av	2412	92.27	*	-		
			Pk	4824	62.77	74.00	-11.23		
			Av	4824	51.04	54.00	-2.96		
		H	Pk	2390	59.5	74.00	-14.50		
			Av	2390	47.12	54.00	-6.88		
			Pk	2412	95.56	*	-		
			Av	2412	85.41	*	-		
			Pk	4824	57.05	74.00	-16.95		
			Av	4824	45.89	54.00	-8.11		
	Mid	V	Pk	2442	102.67	*	-		
			Av	2442	92.88	*	-		
			Pk	4884	58.87	74.00	-15.13		
			Av	4884	46.69	54.00	-7.31		
			H	Pk	2442	94.89	*	-	
				Av	2442	86.25	*	-	
		Pk		4884	59.12	74.00	-14.88		
		Av		4884	46.21	54.00	-7.79		
		High		V	Pk	2472	100.63	*	-
					Av	2472	89.35	*	-
			Pk		2483.5	68.66	74.00	-5.34	
			Av		2483.5	49.44	54.00	-4.56	
	Pk		4944		56.45	74.00	-17.55		
	Av		4944		41.06	54.00	-12.94		
	H		Pk	2472	85.19	*	-		
			Av	2472	74.59	*	-		
			Pk	2483.5	55.06	74.00	-18.94		
			Av	2483.5	34.16	54.00	-19.84		
Pk			4944	54.62	74.00	-19.38			
Av			4944	41.81	54.00	-12.19			

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GC Values used during testing:

Frequency	GC 2412 MHz	GC 2417 MHz	GC 2422 MHz	GC 2427 MHz	GC 2432 MHz	GC 2437MHz	GC 2442 MHz	GC 2447 MHz	GC 2452 MHz	GC 2457 MHz	GC 2462 MHz	GC 2467 MHz	GC 2472MHz
Data Rate													
802.11-b													
1-mbps	38	38	38	38	38	38	38	38	38	38	38	38	38
2-mbps	42	42	42	42	42	42	42	42	42	42	42	42	42
5.5-mbps	50	50	50	50	50	50	50	50	50	50	50	50	50
11-mbps	54	54	54	54	54	54	54	54	54	54	54	54	52
802.11-g													
6-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
9-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
12-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
18-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
24-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
36-mbps	55	57	57	57	57	57	57	57	57	57	57	57	50
48-mbps	55	55	55	55	55	55	55	55	55	55	55	55	50
54-mbps	55	55	55	55	55	55	55	55	55	55	55	55	50
802.11-n													
MCS-0(6.5-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-1(13-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-2(19.5-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-3(26-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-4(39-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-5(52-mbps)	54	57	57	57	57	57	57	57	57	57	57	57	48
MCS-6(58.5-mbps)	54	55	55	55	55	55	55	55	55	55	55	55	48
MCS-7(65-mbps)	54	55	55	55	55	55	55	55	55	55	55	55	48