Prüfbericht - Nr.: *Test Report No.:*	**ULR-TC568819300000085F**	**Seite 1 von 111** *Page 1 of 111*
Auftraggeber: *Client:*	**Honeywell** **12, Clintonville Rd, Northford, CT,** **USA 06472; +1 203 4847161**	
Gegenstand der Prüfung: *Test item:*	**GLSS Gateway**	
Bezeichnung: *Identification:*	**CGW-MB**	**Serien-Nr.:** **850020000300129B70045** *Serial No.*
Wareneingangs-Nr.: *Receipt No.:*	**166211445**	**Eingangsdatum:** **04.12.2019** *Date of receipt:*
Prüfort: *Testing location:*	**Refer Page 5 of 111 for Test site details**	
Prüfgrundlage: *Test specification:*	**FCC Part 15 Subpart C 15.247, 15.209, 15.207** **ANSI C63.10 2013**	
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).*	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 27/B, 2nd Cross Road, Electronic City Phase1, Bangalore – 560 100, India FCC Test Site Registration No.: 496599	

geprüft / *tested by:*			**kontrolliert** / *reviewed by:*		
17.12.2019	Raviraj Kamati Engineer	Rak	24.10.2019	Raghavendra Katti Assistant Manager	Raghu. K.
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges /*Other Aspects:* **FCC ID:PV3CGWMB**

Abkürzungen:				***Abbreviations:***			
P(ass)	=	***entspricht Prüfgrundlage***		***P(ass)***	=	***passed***	
F(ail)	=	***entspricht nicht Prüfgrundlage***		***F(ail)***	=	***failed***	
N/A	=	***nicht anwendbar***		***N/A***	=	***not applicable***	
N/T	=	***nicht getestet***		***N/T***	=	***not tested***	

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.

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.

TEST SUMMARY

Test Item	FCC	Result
Maximum Conducted Output Power	15.247 (b) (3)	Pass
6 dB / DTS Bandwidth	15.247 (a) (2)	Pass
Maximum Power Spectral Density	15.247 (e)	Pass
Emissions in non – restricted band	15.247 (d)	Pass
Radiated spurious emissions and emissions in Restricted bands of operation	15.247 (d) / (15.209 & 15.205)	Pass
Conducted Emissions on A.C. Power Lines	15.207	Pass

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Table of Contents

1 GENERAL REMARKS

1.1 Complimentary Materials

All attachments are integral part of this test report. This applies especially to the following appendix:

1: Test Setup Photo

2: EUT External Photo

3: EUT Internal Photo

4: FCC Label and Label Location

5: Block Diagram

6: Specification of EUT

7: Schematic Diagrams

8: Bill of Material

9: User Manual

10: Maximum Permissible Exposure Information

2 TEST SITES

2.1 Testing Facilities

TÜV Rheinland (India) Private Limited.
27/B, 2nd Cross,
Electronic City Phase1
Bangalore – 560 100,
India

TUV Rheinland (India) Private Limited.
108 , Beside ISBR Business School,
Electronic City Phase1
Bangalore - 560 100.
India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Used for Test Items
USB Wideband Power Sensor	AIMIL Ltd	55006	10231	-	22-12-2019	Yearly	Antenna - Port Measurements
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	A.14.06	28-03-2020	Yearly	
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11-10-2020	Yearly	Radiated Spurious Emission
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	15-01-2020	Yearly	
Biconical Antenna	Schwarzbeck mess-elektronik	VHBB-9124 / BBA-9106	9124-656	-	16-01-2020	Yearly	
Log-Periodic Antenna	Schwarzbeck	FMZB 1519 B	1519B-00111	-	16-01-2020	Yearly	
Broadband Horn Antenna	Frankonia	BBHA 9120 D	9120D-1944	-	16-01-2020	Yearly	
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-0904	-	21-01-2020	Yearly	
Semi Anechoic Chamber	Frankonia	-	-	-	-	-	
Fully Anechoic Chamber	Albatross	-	-	-	-	-	
EMI Receiver	Rohde & Schwarz	ESR7	101133	V7.0-4-62-2	16-01-2020	Yearly	AC Power line conducted emission
LISN	Rohde & Schwarz	ENV 216	100022	-	05-09-2020	Yearly	
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100811	-	01-08-2020	Yearly	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement	EMC 32	10.50.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

Gateway Connect is an embedded and intelligent gateway for connected buildings. It enables system maintenance providers as well as end users to remotely manage connected fire detection systems. The gateway also supports them to ensure compliance.

Operational description: The gateway acts as a portal among fire alarm panels, and peripheral devices. The gateway connection with the fire alarm panel enables reading the inventory and transmitting the data. The connection with Cloud facilities remotely monitoring and managing the fire detection systems.

3.2 Ratings and System Details declared by client*

Table 3: Ratings and System Details

Radio Protocol	**WLAN (2.4GHz)**	**BLE**	**BLUETOOTH**	**WLAN (5GHz)**
Operating Frequency Range	2412MHz – 2462MHz	2402MHz – 2480MHz		5150MHz to 5250MHz 5250MHz to 5350MHz 5470MHz to 5725MHz
No. of Channel and Supporting Bandwidth	11 Channels , 20MHz	40	79	Only 20MHz
Channel Spacing	5MHz	2MHz	1MHz	10MHz
Modulation	802.11b: CCK and DSSS 802.11g: OFDM 802.11n: OFDM	GFSK	GFSK, pi/4-DQPSK, 8-DPSK	802.11a: OFDM 802.11n: OFDM
Number of antennas	2	1	1	2
Antenna Gain & Type	3dBi & Printed F Antenna			6.5 dBi & Printed F Antenna
Supply Voltage to Product	24V DC			
Dimensions	200mm x 70mm x 255mm			
Environmental conditions (Operating and Storage)	-10ºC to +60º C			

Note: The product does not support simultaneous transmission. Conducted output power measured with respect to each protocol with single transmission chain

*__Disclaimer__: The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results.

Table 4: Report No. References

SL. No.	RF Protocol / Frequency Bands	Report No.
1	WLAN (2.4GHz) and BLUETOOTH LOW ENERGY	ULR-TC568819300000085F
2	BLUETOOTH	ULR-TC568819300000086F
3	WLAN (5GHz)	ULR-TC568819300000087F

3.3 Measurement Uncertainty:

Table 5: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
SAC, radiated measurement	±6 dB
FAC, radiated measurement	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

Note: The listsed uncertainities are the worst case uncertainity for the entire range of mesurements and are for the reporting purpose only and are not used in determining the PASS/FAIL of the results.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

Transmission was enabled with highest possible duty cycle transmission on low, mid and high channel.

4.2 Test Operation and Test Software

Test Software and Hardware Name : FW 2.0, PC Utility 1.4
Software version : 2.1.7.0
Hardware name : CCM-BM28
Hardware version : RevA

4.3 Test modes – data rates and modulations

For an antenna port measurement and radiated spurious emissions, the tests were performed for both antennas and worst test results are reported in this test report.

4.4 Special Accessories and Auxiliary Equipment

- Test laptop and USB cable

4.5 Countermeasures to achieve EMC Compliance

- None

4.6 List of frequencies

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

Table 6: List of Wi-Fi center Frequencies

Frequency Band	Channel No.	Frequency (MHz)
5150–5350 MHz	36	5180
	48	5240
	64	5320
5470-5725 MHz	100	5500
	140	5700

Table 7: 5GHz WLAN -20MHz Bandwidth Channels List

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2400 – 2483.5	0	2402
	1	2404
	2	2406
	3	2408
	:	:
	:	:
	18	2438
	19	2440
	20	2437
	:	:
	:	:
	36	2474
	37	2476
	38	2478
	39	2480

Table 8: List of BLE center Frequencies

Frequency Band (MHz)	Channel No.	Channel Frequency (MHz)
2400 – 2483.5 BT(BDR+EDR)	0	2402
	1	2403
	2	2404
	3	2405
	:	:
	:	:
	:	:
	37	2439
	38	2440
	39	2441
	40	2442
	:	:
	:	:
	:	:
	74	2476
	75	2477
	:	:
	:	:
	78	2480

Table 9: List of Bluetooth center Frequencies

5 TEST METHODOLOGY

5.1 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 1 GHz & 1.5 m height for above 1 GHz measurement, 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 1 m and 4 m, 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 1000 MHz was performed by horn antenna, The measurement below 30 MHz was performed by loop antenna, Measurement from 30 MHz to 200 MHz was performed by Baloon and Biconical Antenna, and mesurement from 200 MHz to 1 GHz was performed by Log-Periodic Antenna.

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

Note: Field Strength = Measured Value + Antenna Factor + Cable Loss – Pre-Amplifier Gain

5.1.1 Test Setup Configuration

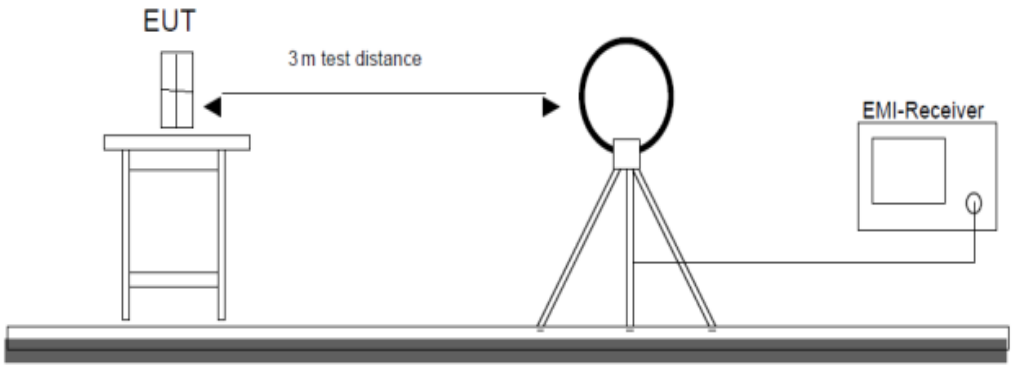


Figure 1: Frequency Range 9 kHz- 30 MHz

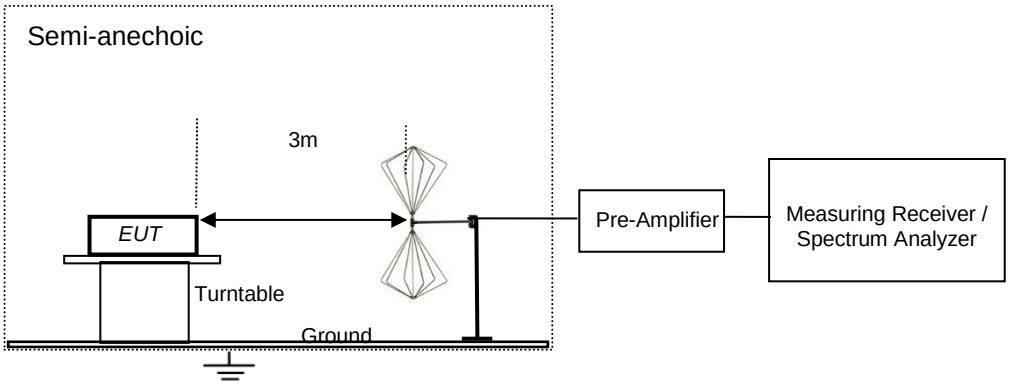


Figure 2: Frequency Range 30 MHz – 200 MHz

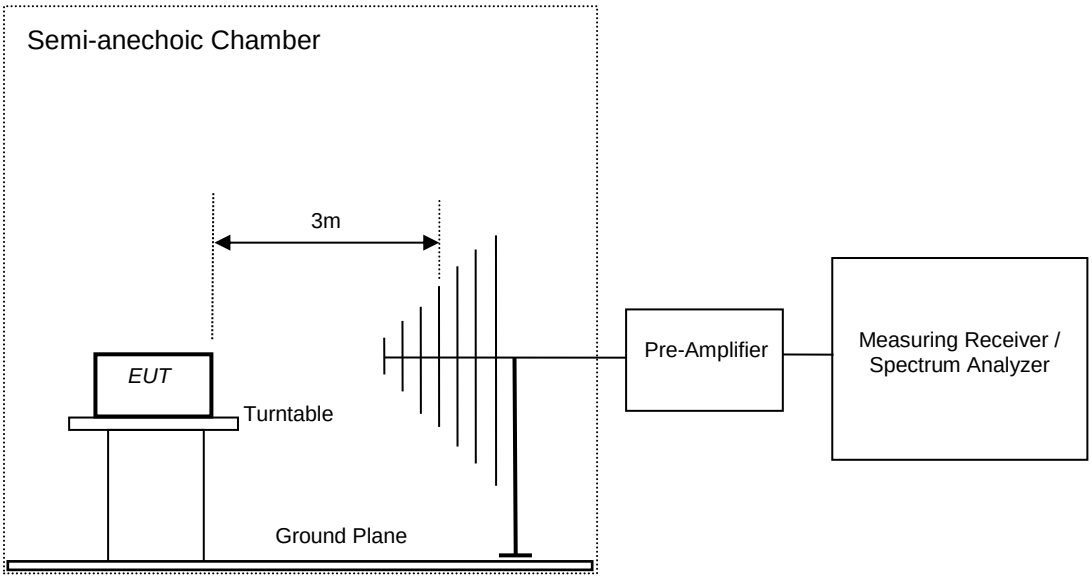


Figure 3: Frequency Range 200 MHz - 1GHz

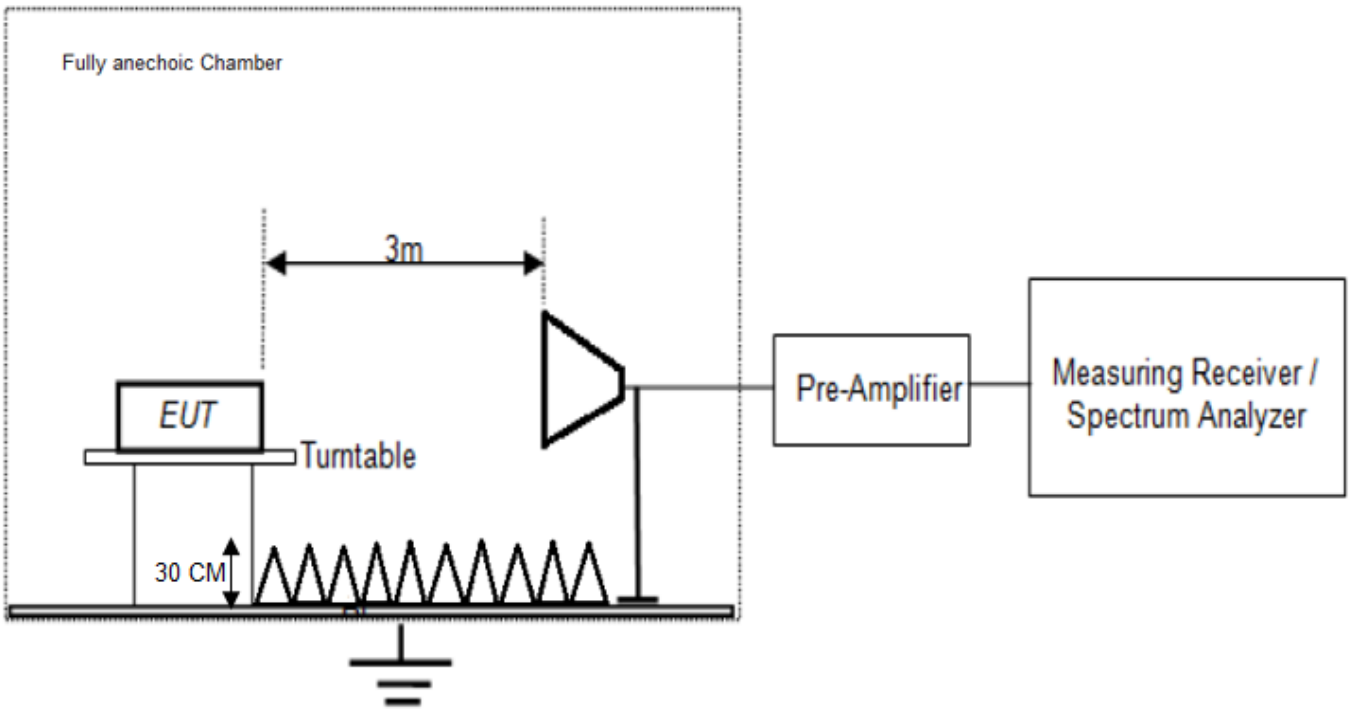


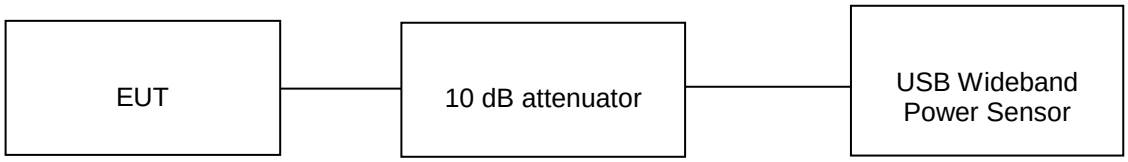
Figure 4: Frequency Range 1GHz – 26GHz

6 TEST RESULTS: WLAN

6.1 Maximum Peak Conducted Output Power

Result ***Pass***

Test Specification	FCC Part 15 Subpart C 15.247 (b) (3)
Measurement Bandwidth	1 MHz
Detector	Peak
Requirement	≤ 1 W (30 dBm)



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

Test results:

Note: Measurements were made as per section 8.3.1.3 in 558074 D01 15.247 Measurement Guidance v05r02.

10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below results.

Table 10: Maximum peak conducted output power verified Test Results

Mode : 802.11b

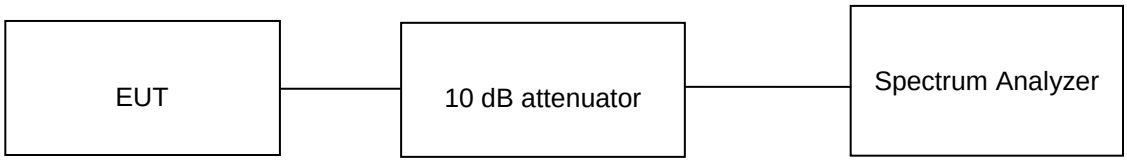
Mode	Data rate (Mbps)	Channel Frequency (MHz)	Maximum Conducted Output Power at Ant 1 (dBm)	Measured Avarage Power at Ant 1 (dBm)	Maximum Conducted Output Power at Ant 2 (dBm)	Measured Avarage Power at Ant 2 (dBm)	Limit (dBm)
802.11b	1	2412	18.136	14.928	17.179	13.990	30
		2442	18.123	14.899	17.274	13.995	30
		2462	17.862	14.706	17.071	13.887	30
	11	2412	17.386	14.439	17.653	14.497	30
		2442	17.153	14.204	17.469	14.271	30
		2462	16.958	14.101	17.293	14.042	30

Mode	Data rate (Mbps)	Channel Frequency (MHz)	Maximum Conducted Output Power Ant 1 (dBm)	Measured Avarage Power at Ant 1 (dBm)	Maximum Conducted Output Power at Ant 2 (dBm)	Measured Avarage Power at Ant 2 (dBm)	Limit (dBm)
802.11g	6	2412	25.157	15.025	24.882	14.149	30
		2442	25.250	14.929	24.752	14.196	30
		2462	24.969	14.679	24.659	13.843	30
	24	2412	23.695	14.331	23.534	14.333	30
		2442	23.499	14.243	23.512	14.236	30
		2462	23.294	13.866	23.818	13.963	30
	54	2412	23.471	13.650	23.723	13.788	30
		2442	24.081	13.702	24.292	13.623	30
		2462	23.115	13.230	23.510	13.318	30
802.11n	MCS0	2412	25.706	14.617	25.182	13.813	30
		2442	25.203	14.458	25.478	13.677	30
		2462	24.987	14.304	24.978	13.389	30
	MCS4	2412	25.212	13.601	24.502	13.541	30
		2442	25.007	13.440	25.704	13.335	30
		2462	24.102	13.102	24.344	13.042	30
	MCS7	2412	24.596	13.905	25.137	13.786	30
		2442	24.486	13.738	25.170	13.700	30
		2462	24.358	13.438	24.568	13.499	30

6.2 Maximum Power Spectral Density

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (e)
Detector Function	Peak
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

Test results:

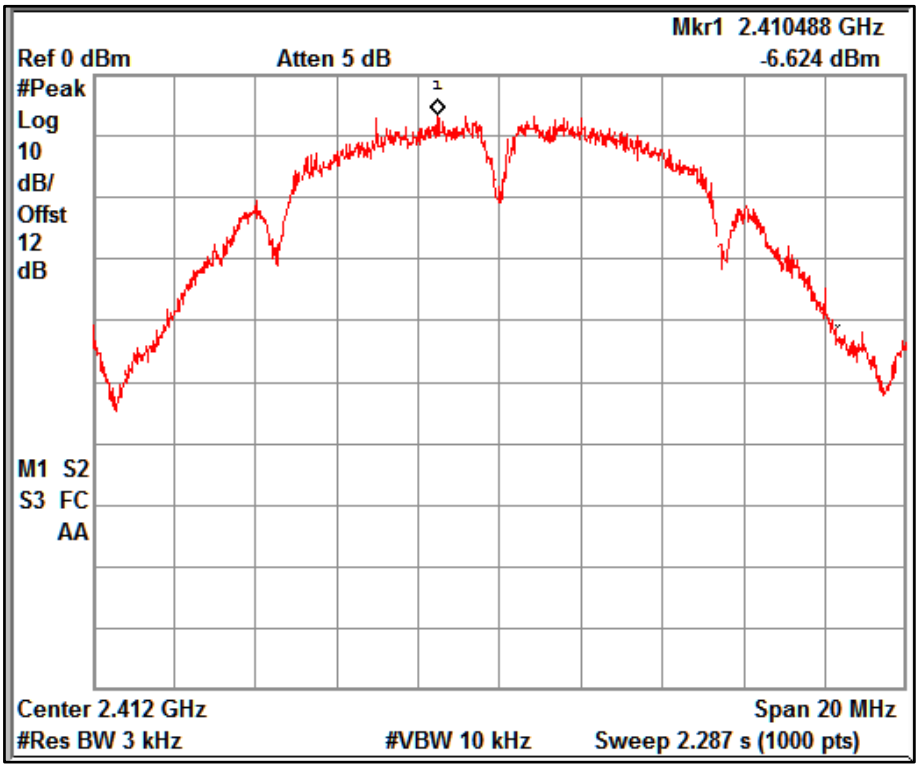
Note: Measurements were made as per section 8.4 in 558074 D01 15.247 Measurement Guidance v05r02.

10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below results

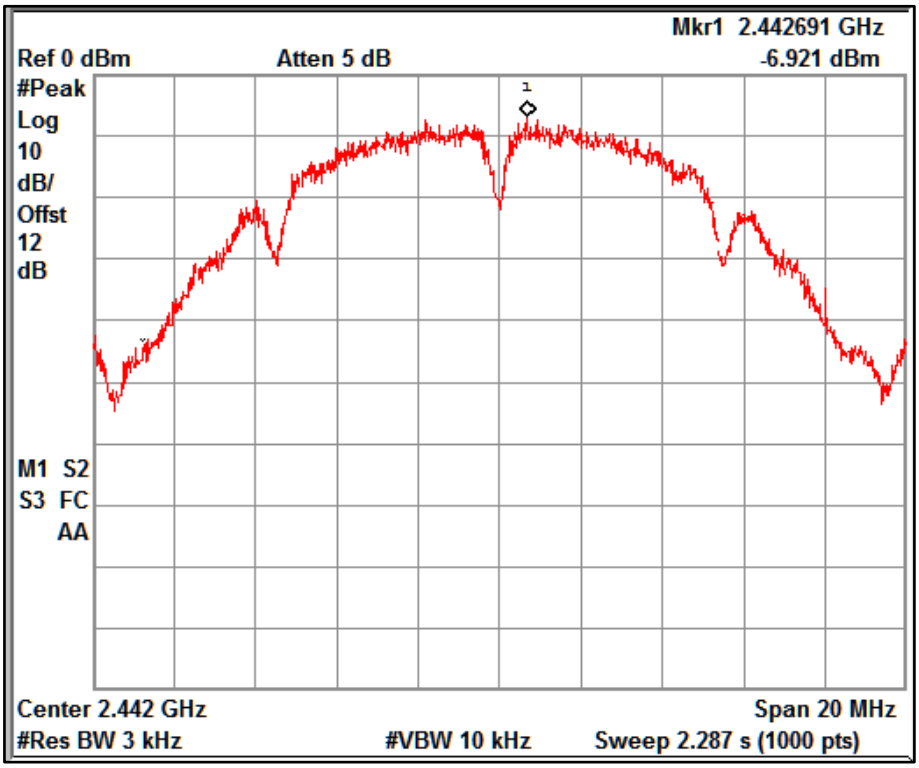
Table 11: Maximum power spectral density verified Test Results

Note: Testing was performed for both antennas and worst results of Antenna 1 is reported

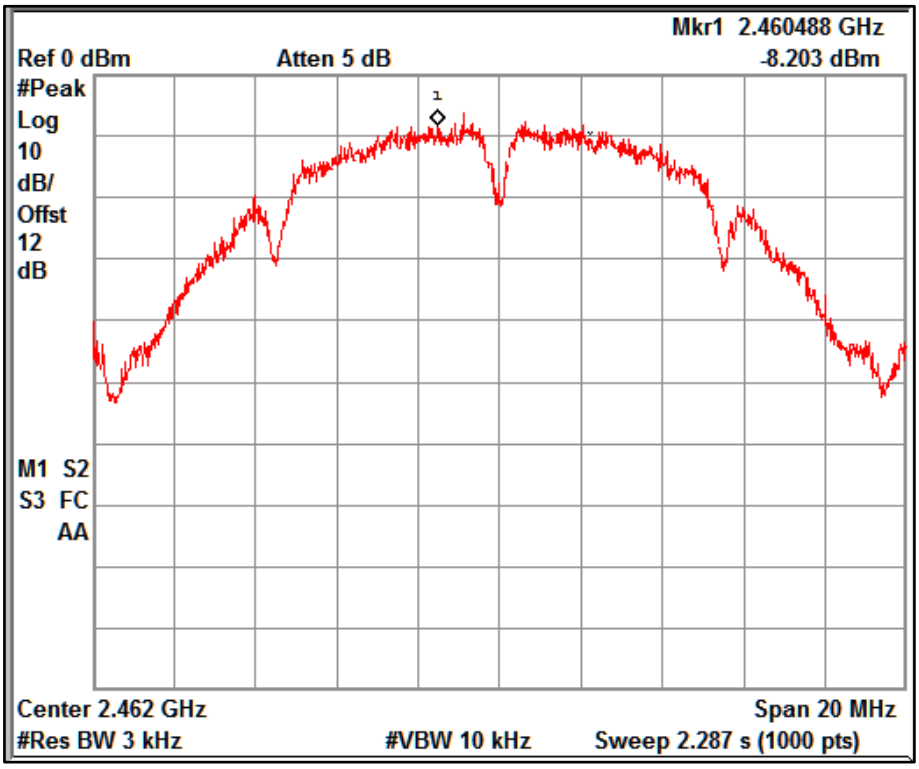
Mode	Data rate (Mbps)	Channel Frequency (MHz)	PSD for Antenna 1 (dBm/3kHz)	Limit (dBm/3kHz)
802.11b	1	2412	-6.624	8
		2442	-6.921	8
		2462	-8.203	8
	11	2412	-8.290	8
		2442	-7.693	8
		2462	-9.210	8



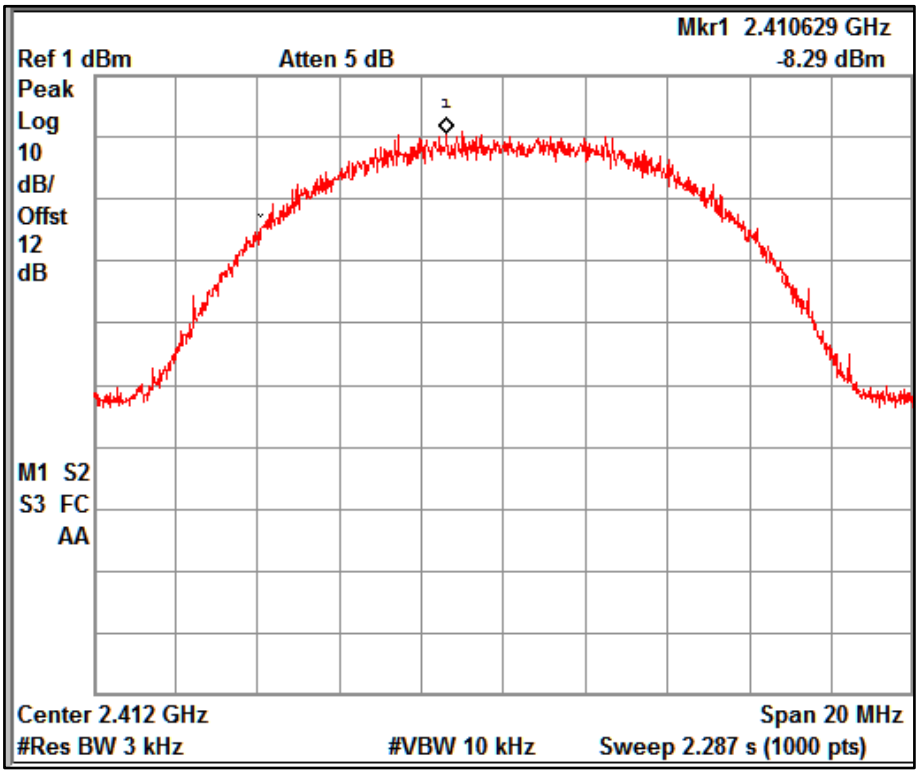
Data rate: 1Mbps Channel Frequency: 2412MHz



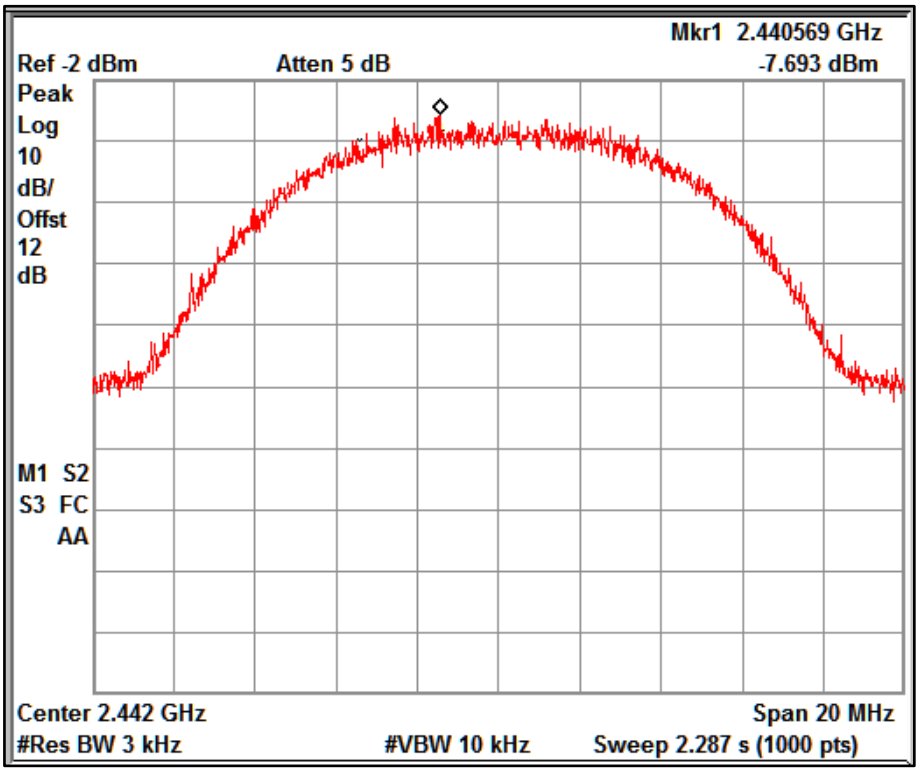
Data rate: 1Mbps Channel Frequency: 2442MHz



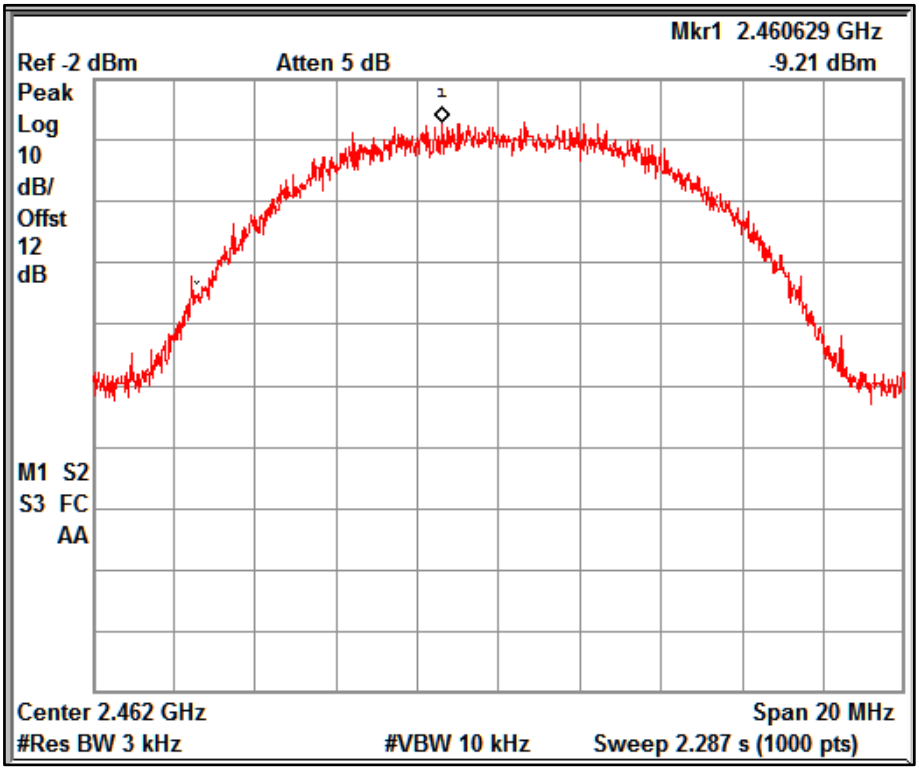
Data rate: 1Mbps Channel Frequency: 2462MHz



Data rate: 11Mbps Channel Frequency: 2412MHz

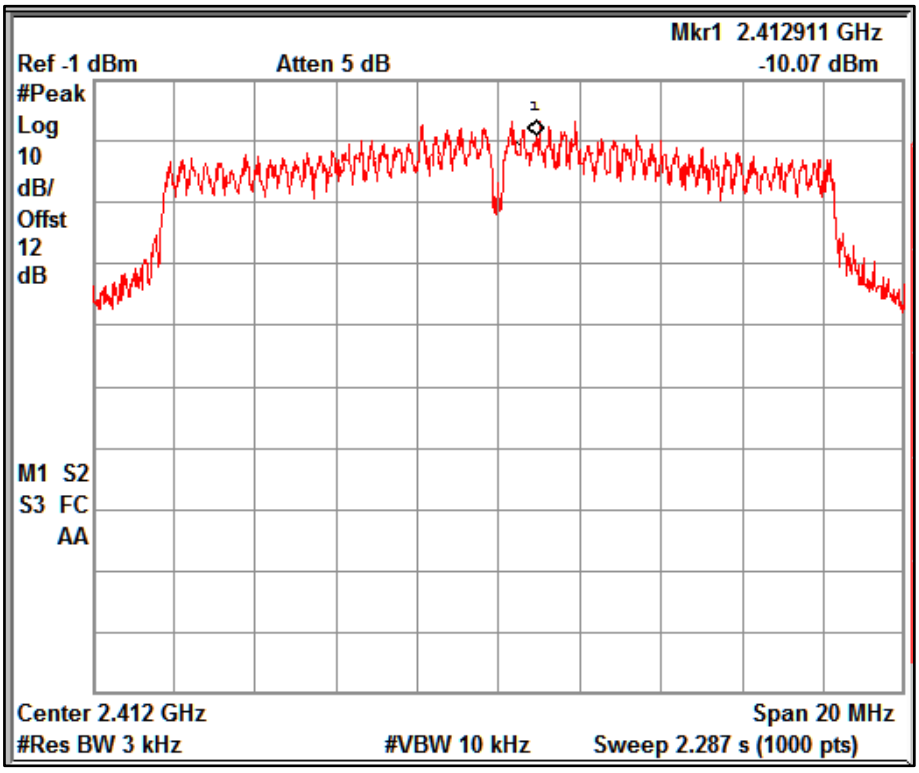


Data rate: 11Mbps Channel Frequency: 2442MHz

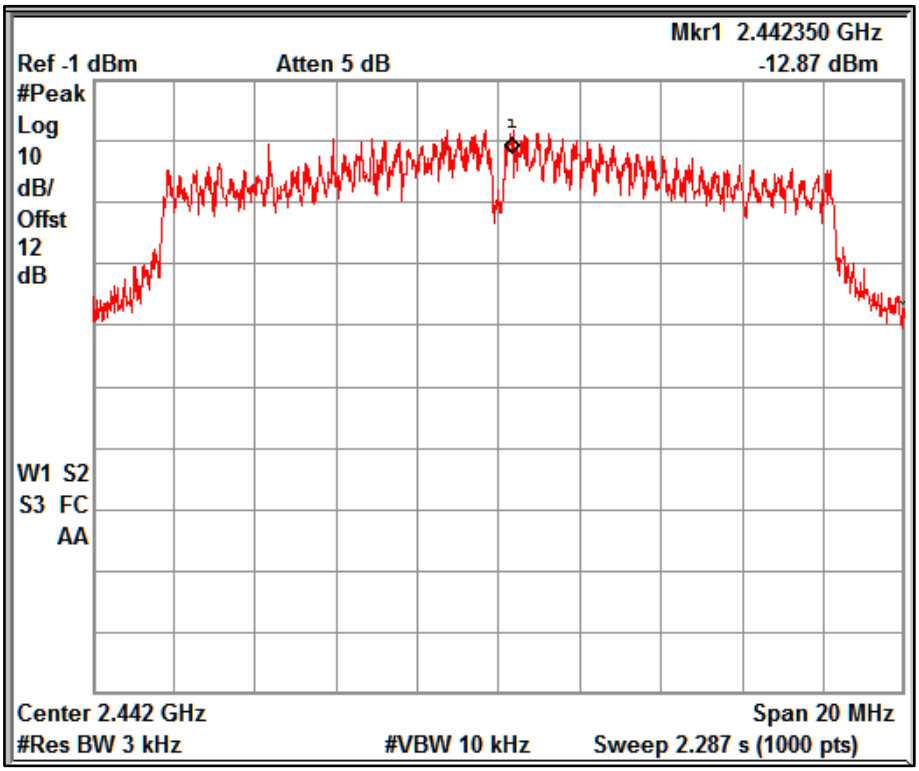


Data rate: 11Mbps Channel Frequency: 2462MHz

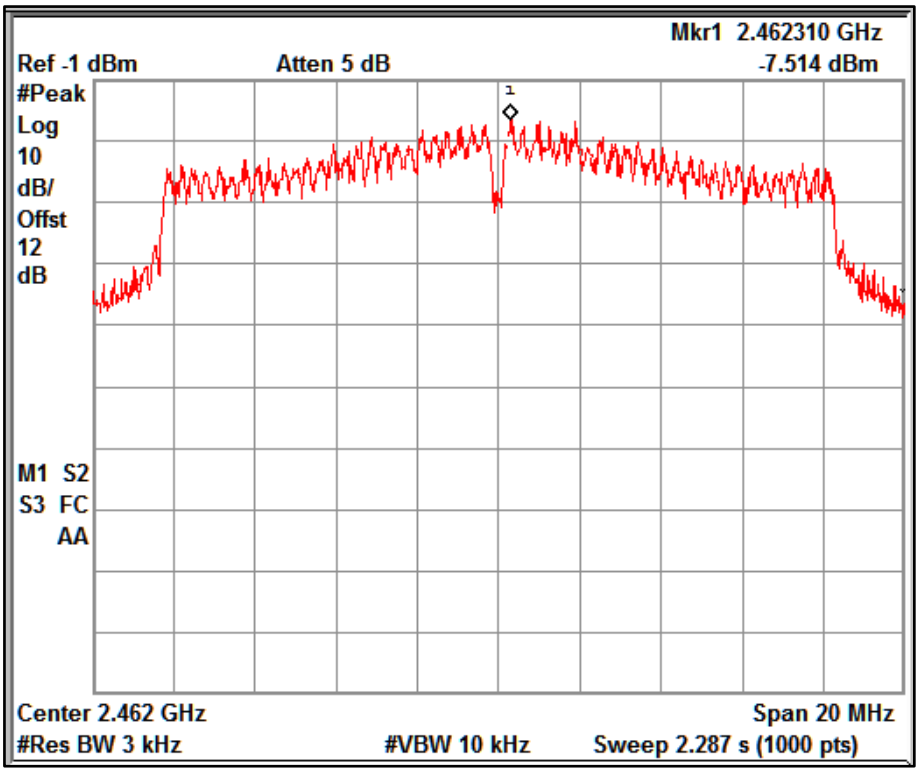
Mode	Data rate (Mbps)	Channel Frequency (MHz)	PSD for Antenna 1 (dBm/3kHz)	Limit (dBm/3kHz)
802.11g	6	2412	-10.07	8
		2442	-12.87	8
		2462	-7.514	8
	24	2412	-9.109	8
		2442	-9.878	8
		2462	-10.18	8
	54	2412	-10.71	8
		2442	-10.15	8
		2462	-10.37	8



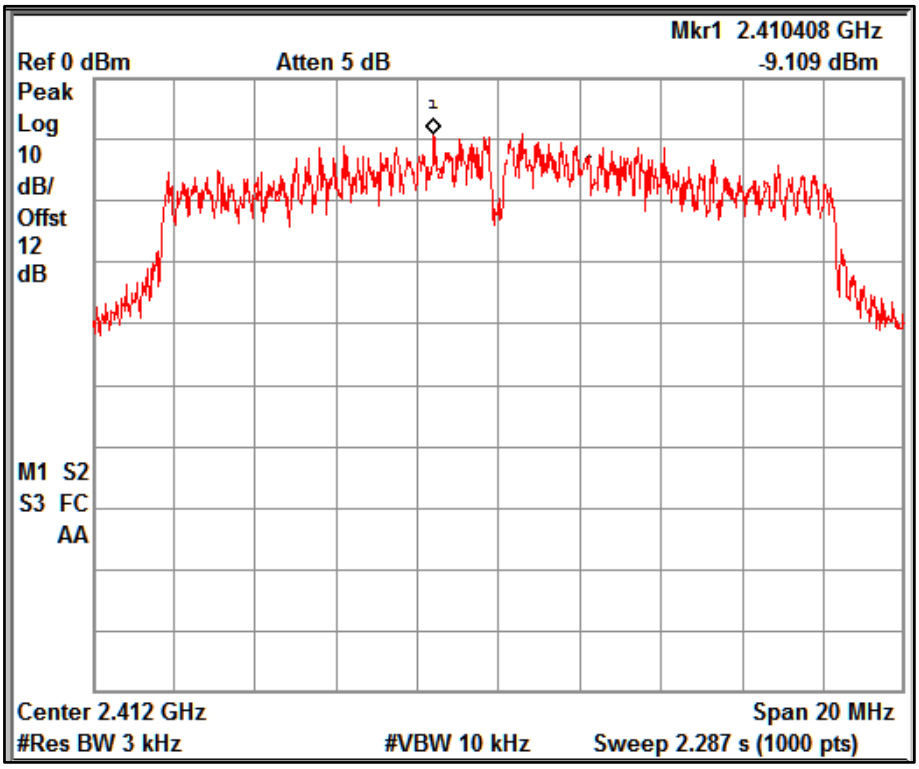
Data rate: 6Mbps Channel Frequency: 2412MHz



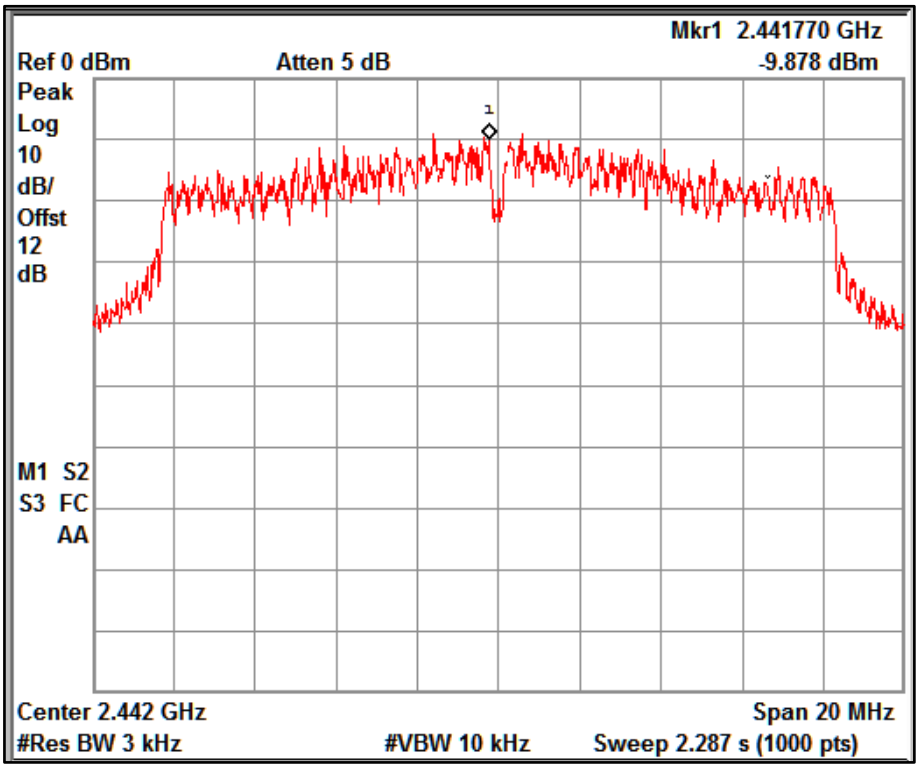
Data rate: 6Mbps Channel Frequency: 2442MHz



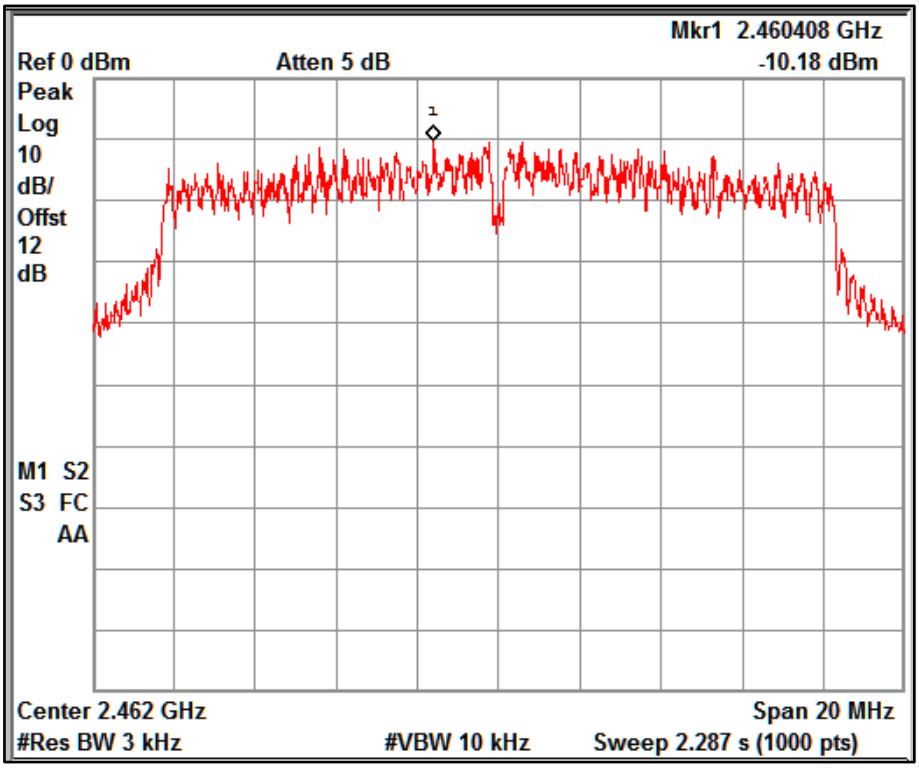
Data rate: 6Mbps Channel Frequency: 2462MHz



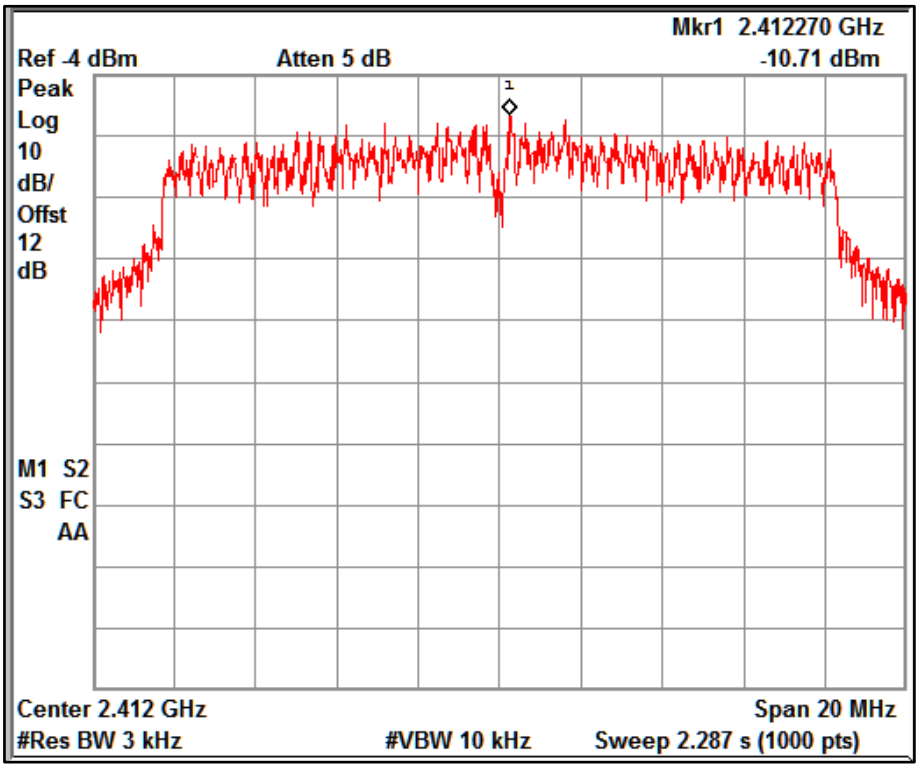
Data rate: 24Mbps Channel Frequency: 2412MHz



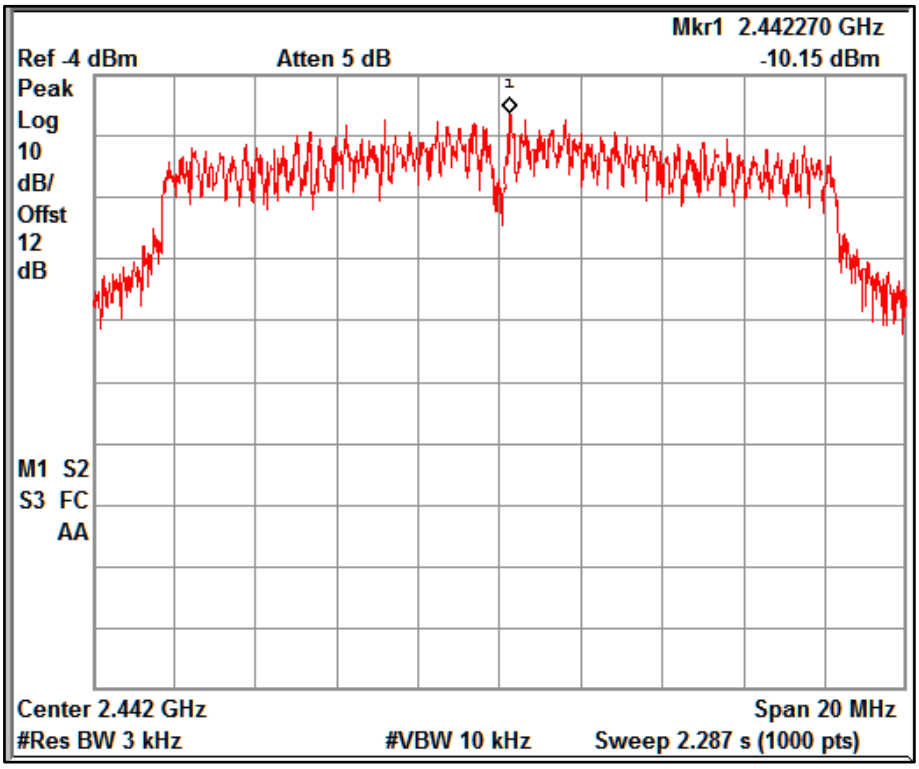
Data rate: 24Mbps Channel Frequency: 2442MHz



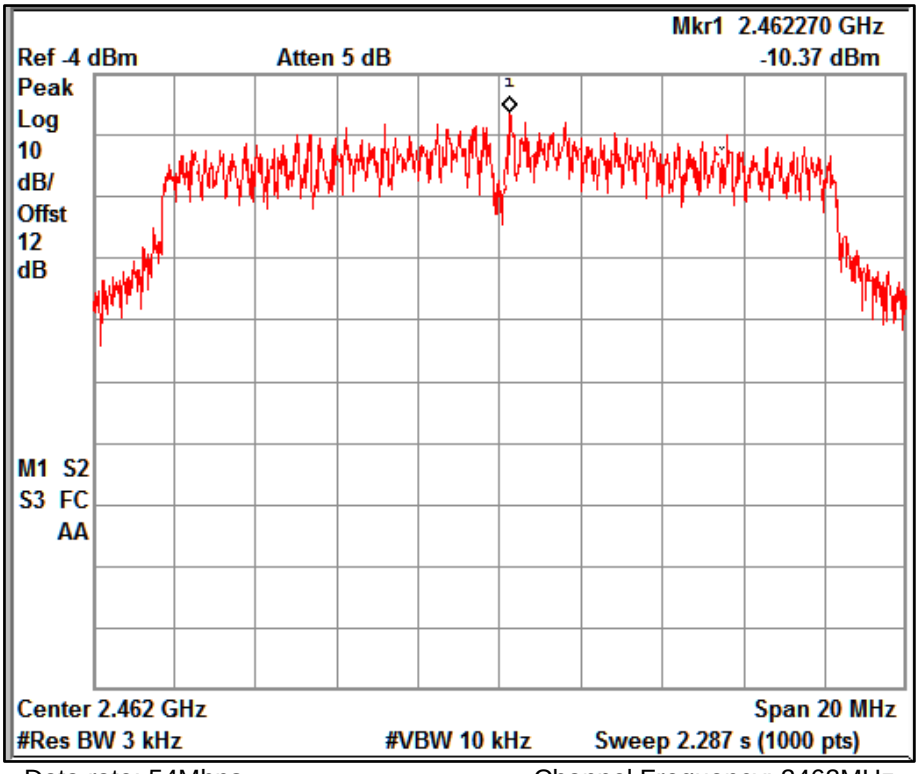
Data rate: 24Mbps Channel Frequency: 2462MHz



Data rate: 54Mbps Channel Frequency: 2412MHz

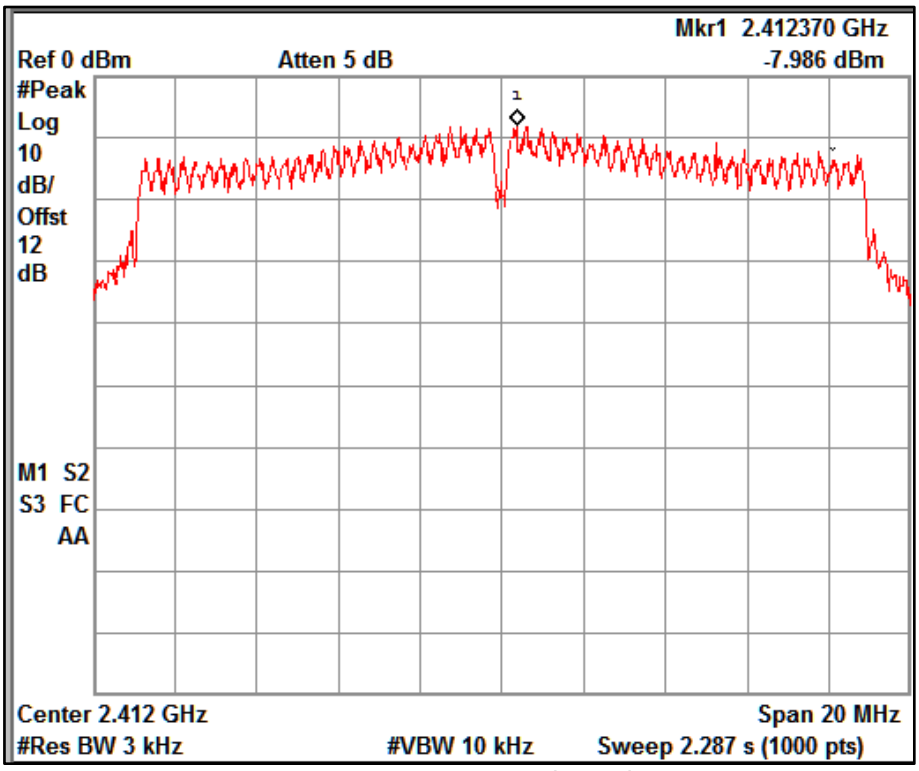


Data rate: 54Mbps Channel Frequency: 2442MHz

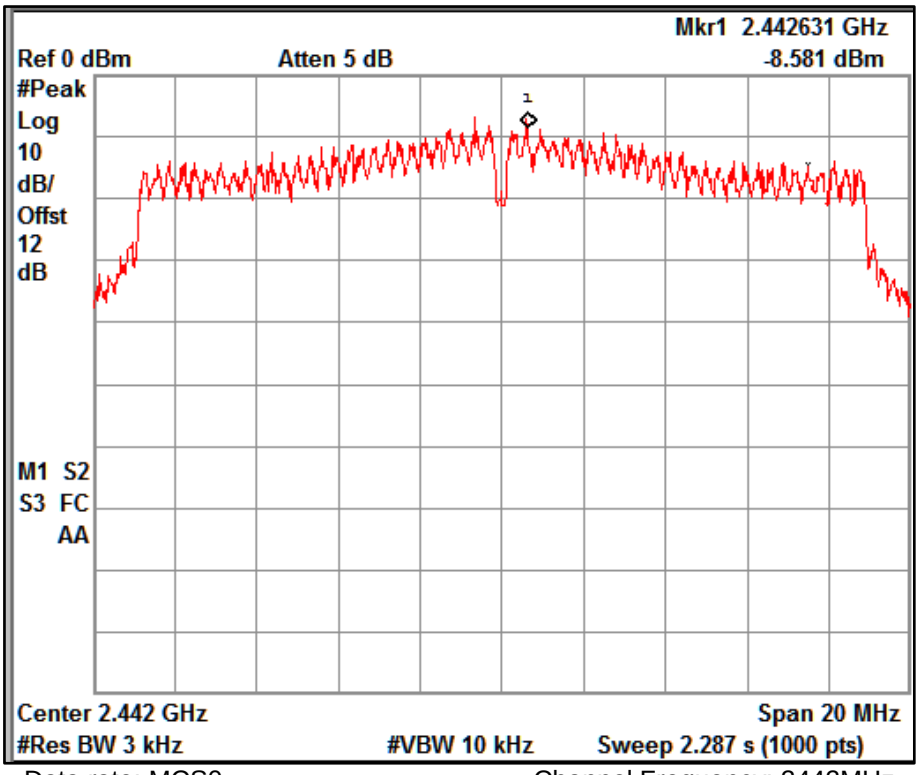


Data rate: 54Mbps Channel Frequency: 2462MHz

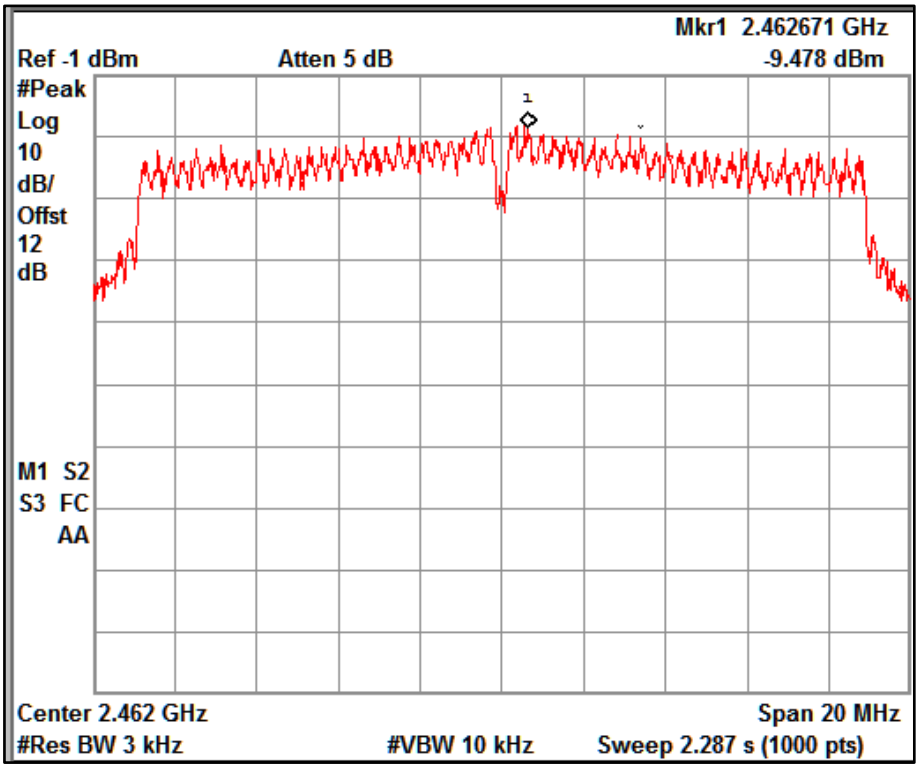
Mode	Data rate (Mbps)	Channel Frequency (MHz)	PSD for Antenna 1 (dBm/3kHz)	Limit (dBm/3kHz)
802.11n (20MHz)	MCS0	2412	-7.986	8
		2442	-8.581	8
		2462	-9.478	8
	MCS4	2412	-9.872	8
		2442	-8.834	8
		2462	-9.355	8
	MCS7	2412	-10.53	8
		2442	-10.93	8
		2462	-10.39	8



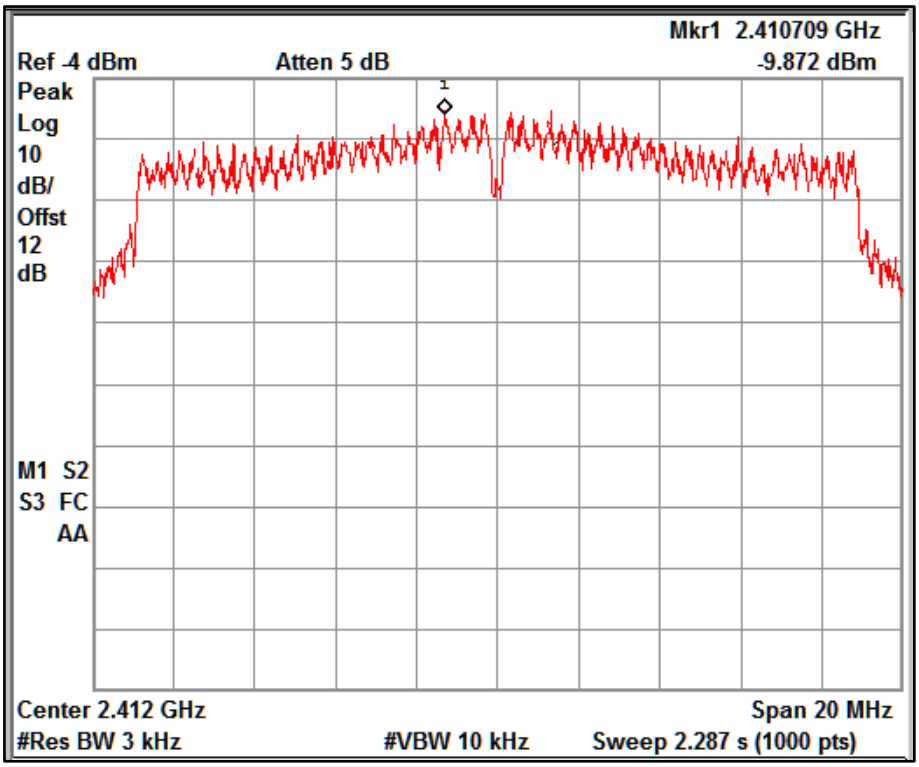
Data rate: MCS0 Channel Frequency: 2412MHz



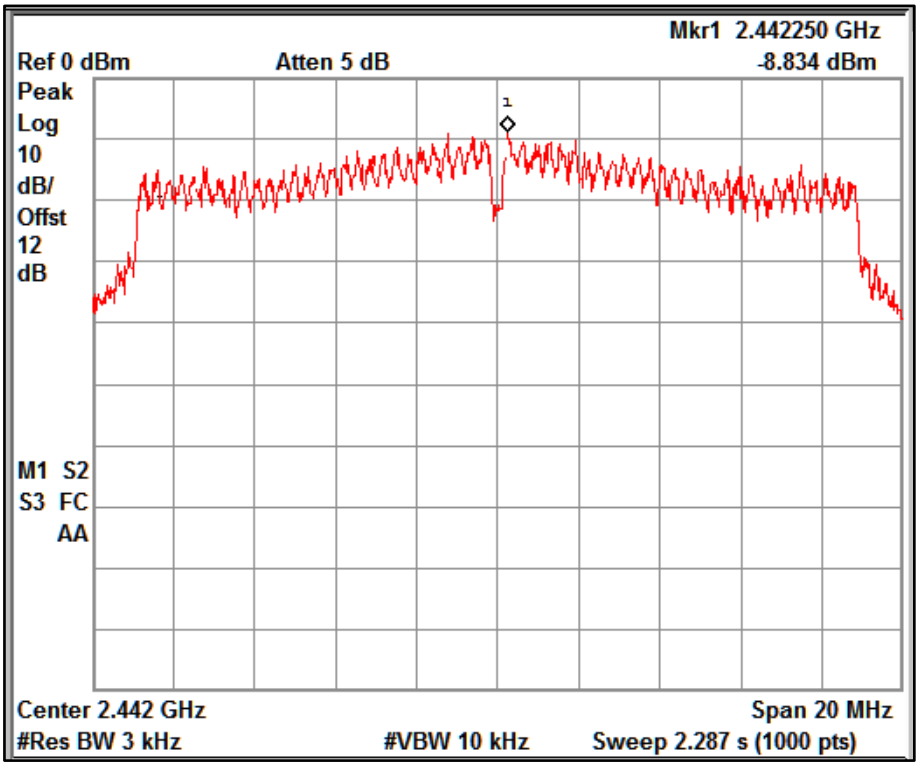
Data rate: MCS0 Channel Frequency: 2442MHz



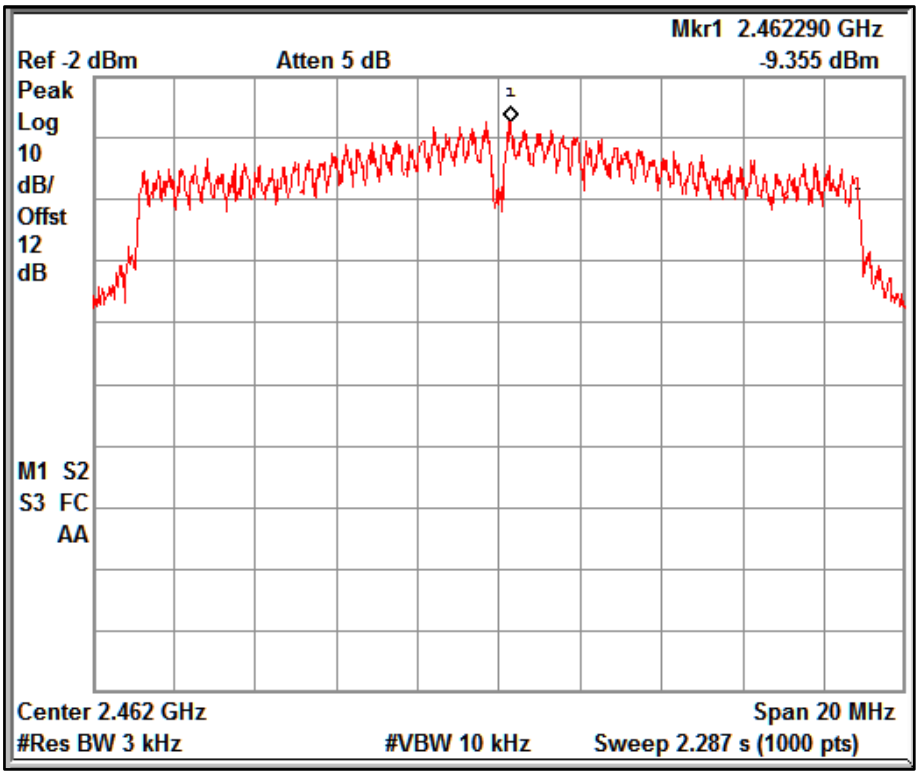
Data rate: MCS0 Channel Frequency: 2462MHz



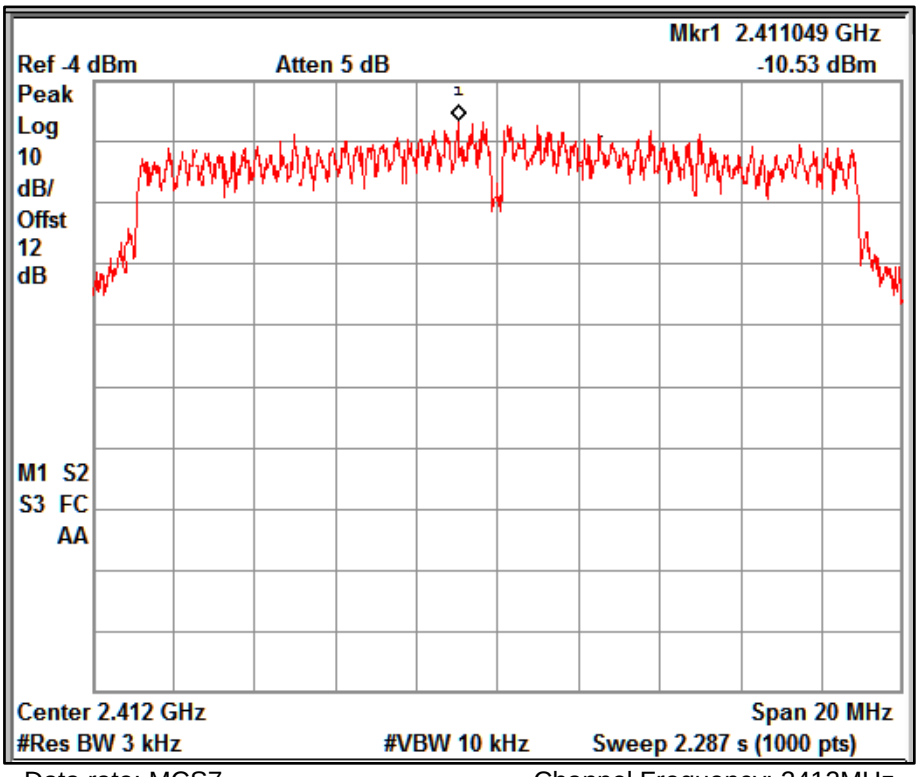
Data rate: MCS4 Channel Frequency: 2412MHz



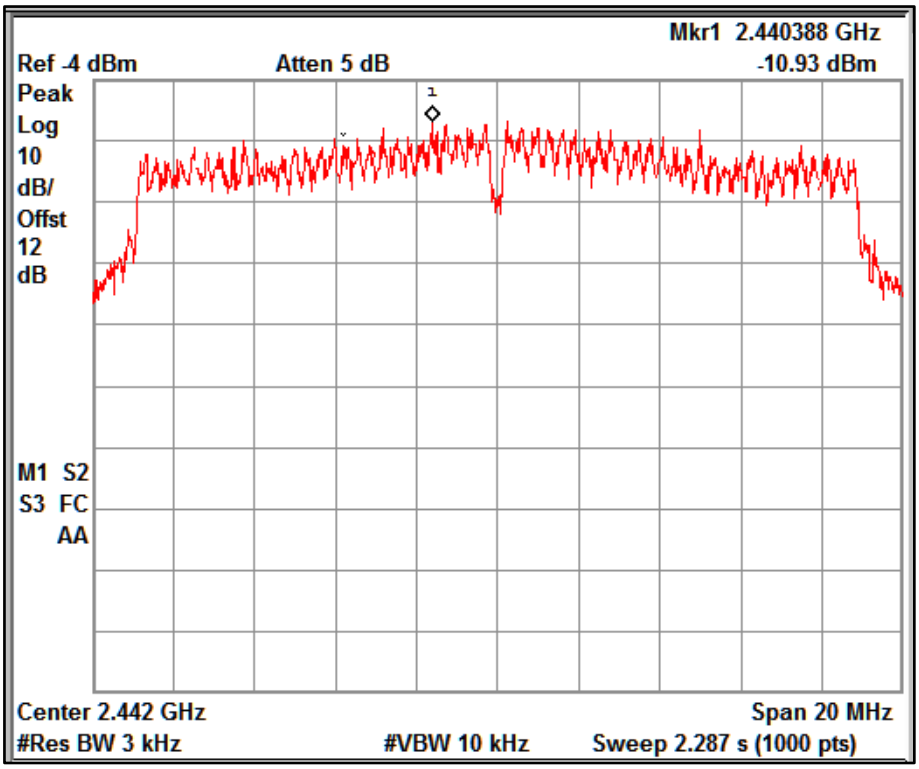
Data rate: MCS4 Channel Frequency: 2442MHz



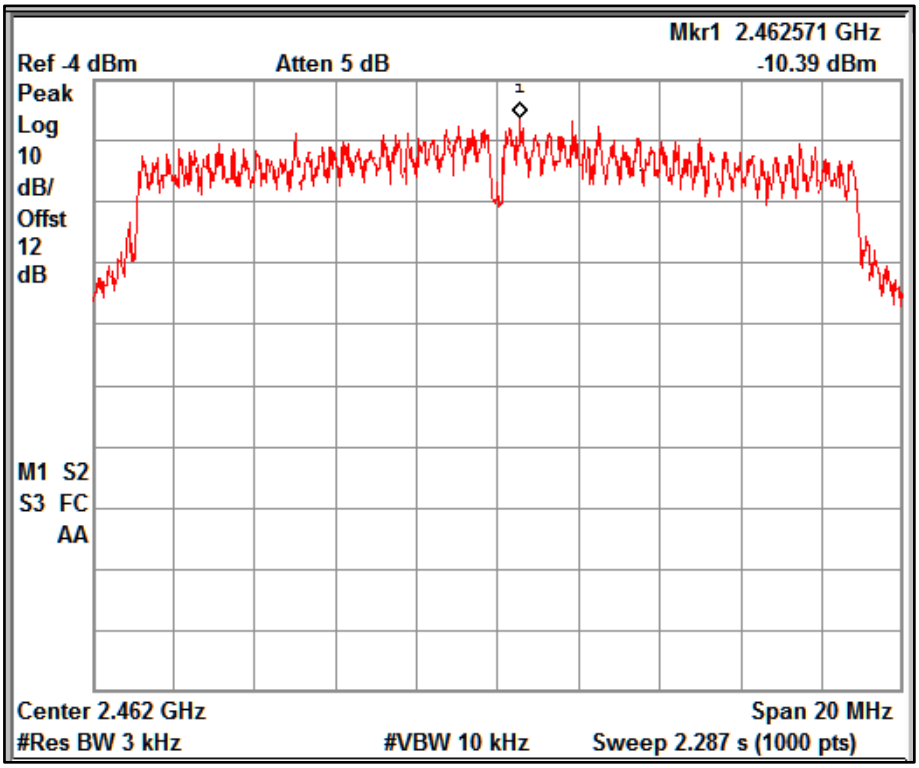
Data rate: MCS4 Channel Frequency: 2462MHz



Data rate: MCS7 Channel Frequency: 2412MHz



Data rate: MCS7 Channel Frequency: 2442MHz

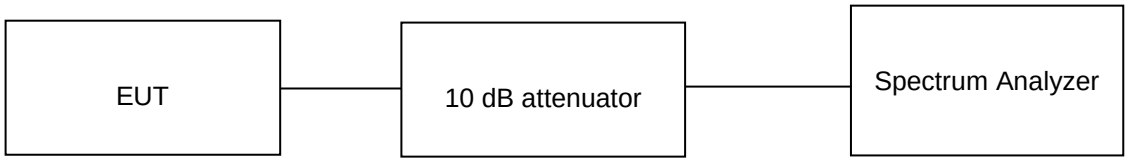


Data rate: MCS7 Channel Frequency: 2462MHz

6.3 DTS Bandwidth

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (a)(2)
Detector	Peak
Port of testing	Antenna Port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz.



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

Test results:

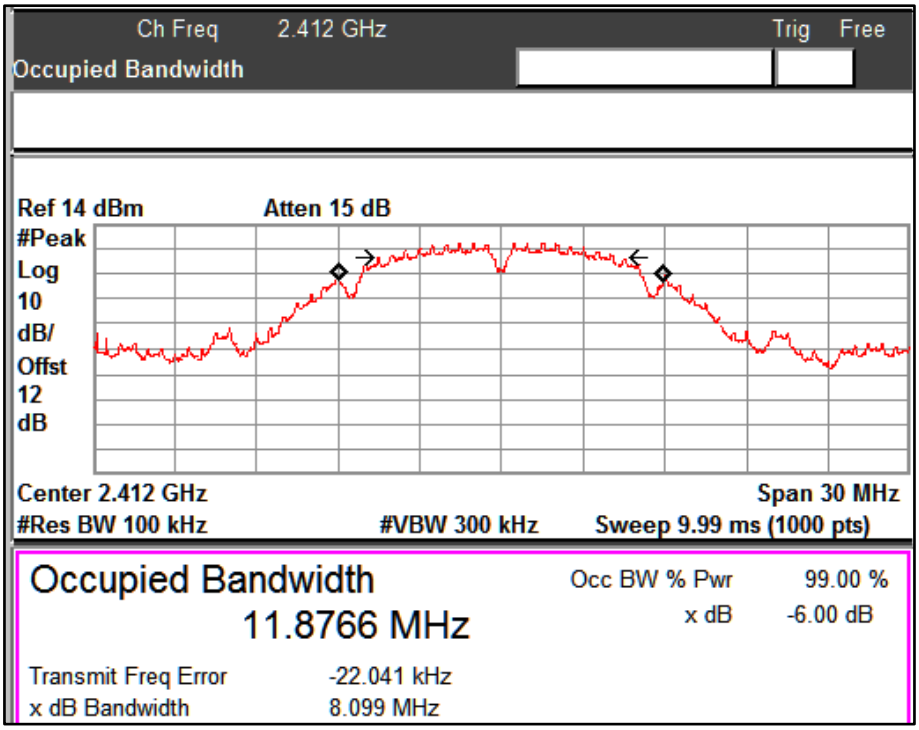
Note: Measurements were made as per section 8.2 in 558074 D01 15.247 Measurement Guidance v05r02.

10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below result.

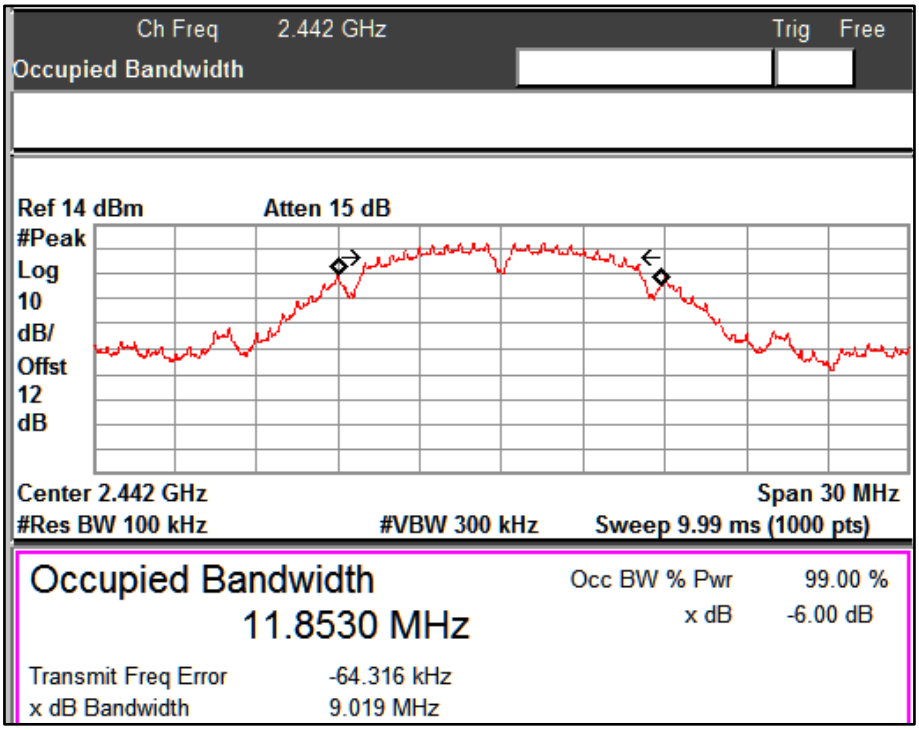
Table 12: DTS Bandwidth verified Test Results

Note: Testing was performed for both antennas and worst results of Antenna 1 is updated

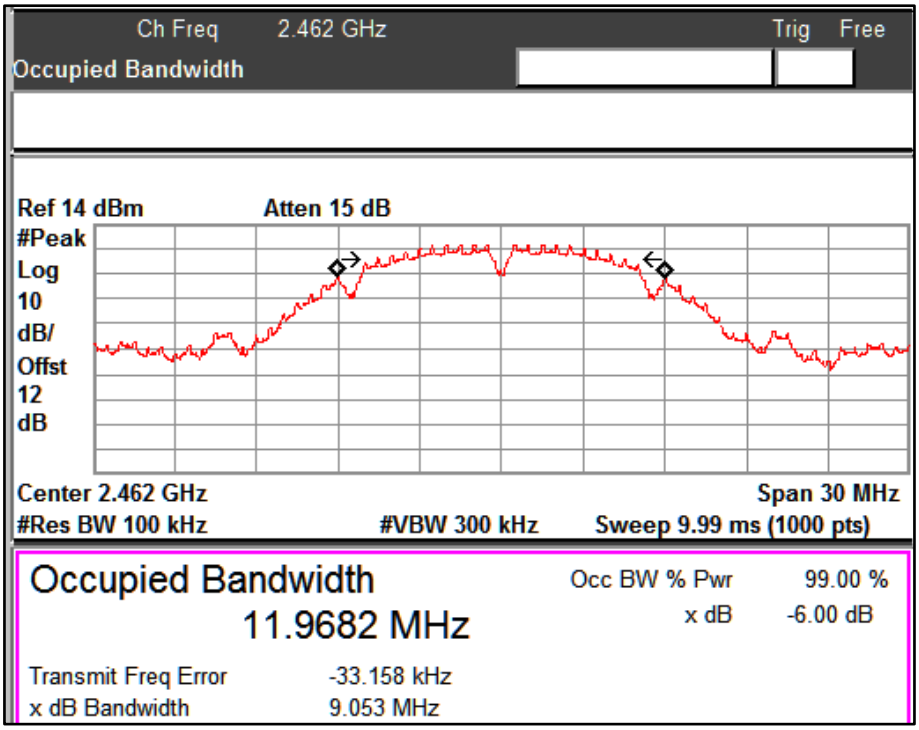
Mode	Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
802.11b	1	2412	8.099	11.877
		2442	9.019	11.853
		2462	9.053	11.968
	11	2412	8.525	11.374
		2442	8.340	11.402
		2462	7.992	11.469



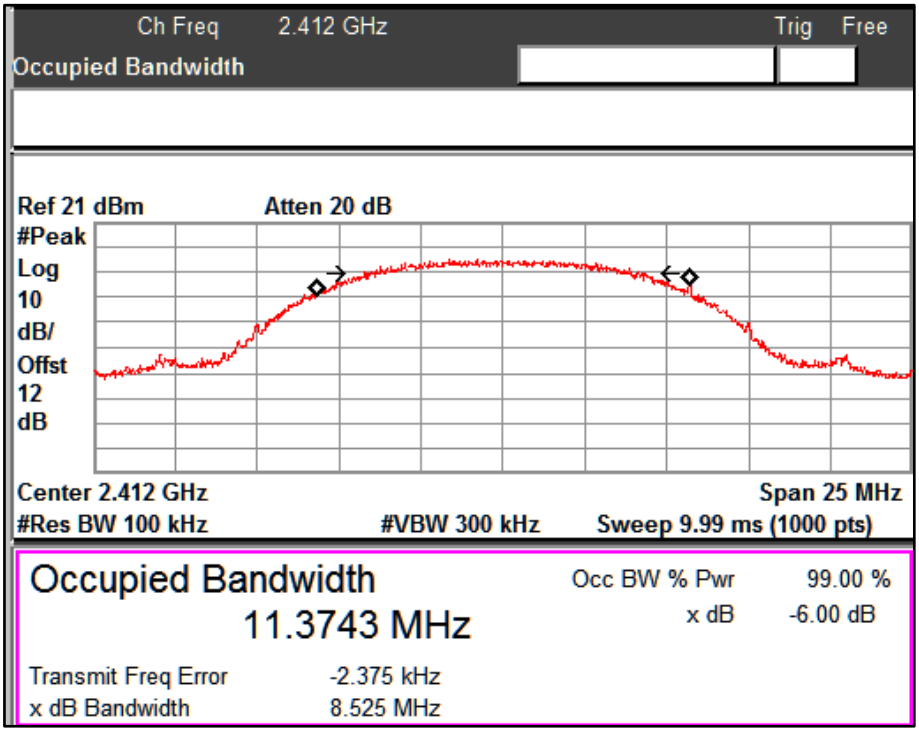
Data rate: 1Mbps Channel Frequency: 2462MHz



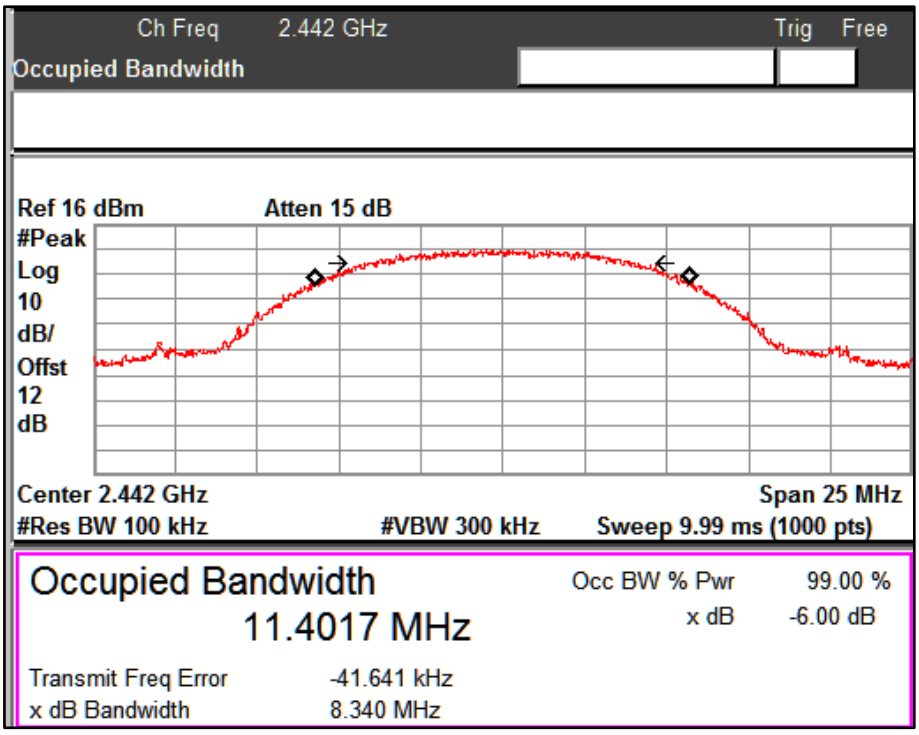
Data rate: 1Mbps Channel Frequency: 2442MHz



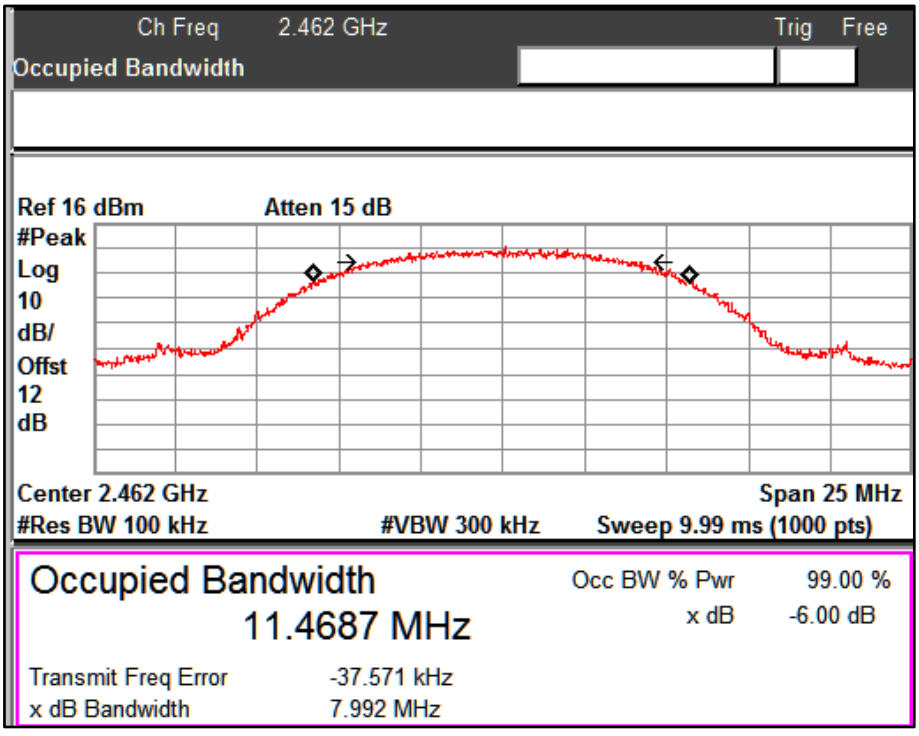
Data rate: 1Mbps Channel Frequency: 2462MHz



Data rate: 11Mbps Channel Frequency: 2412MHz

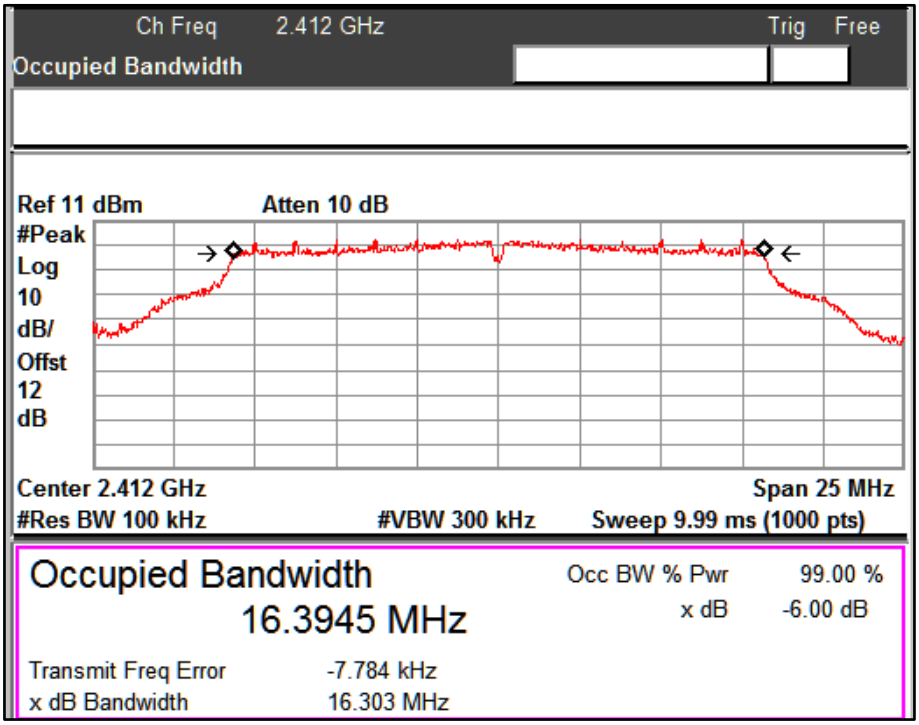


Data rate: 11Mbps Channel Frequency: 2442MHz

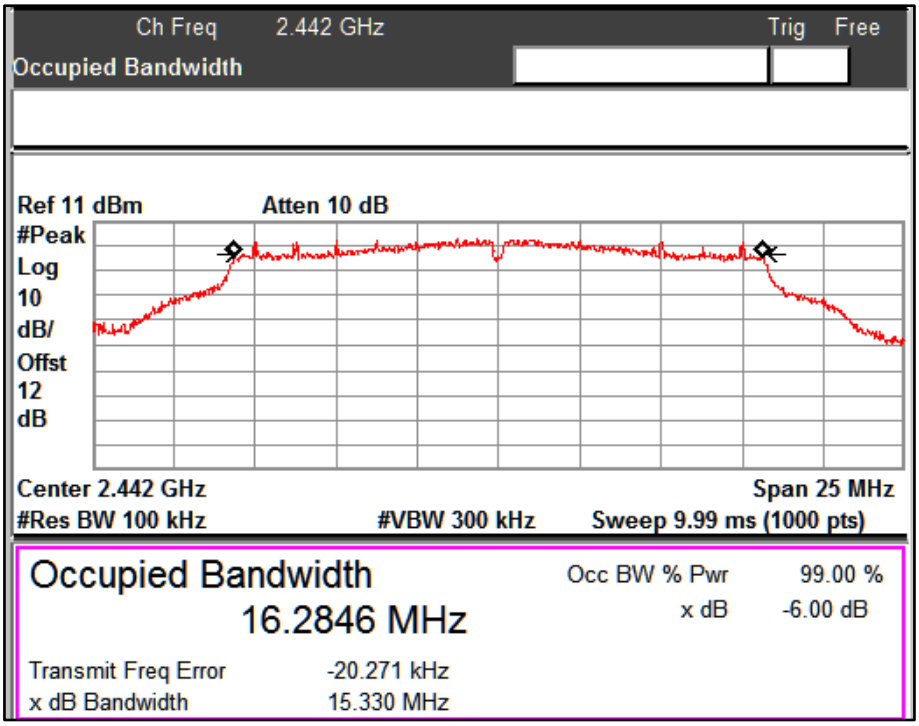


Data rate: 11Mbps Channel Frequency: 2462MHz

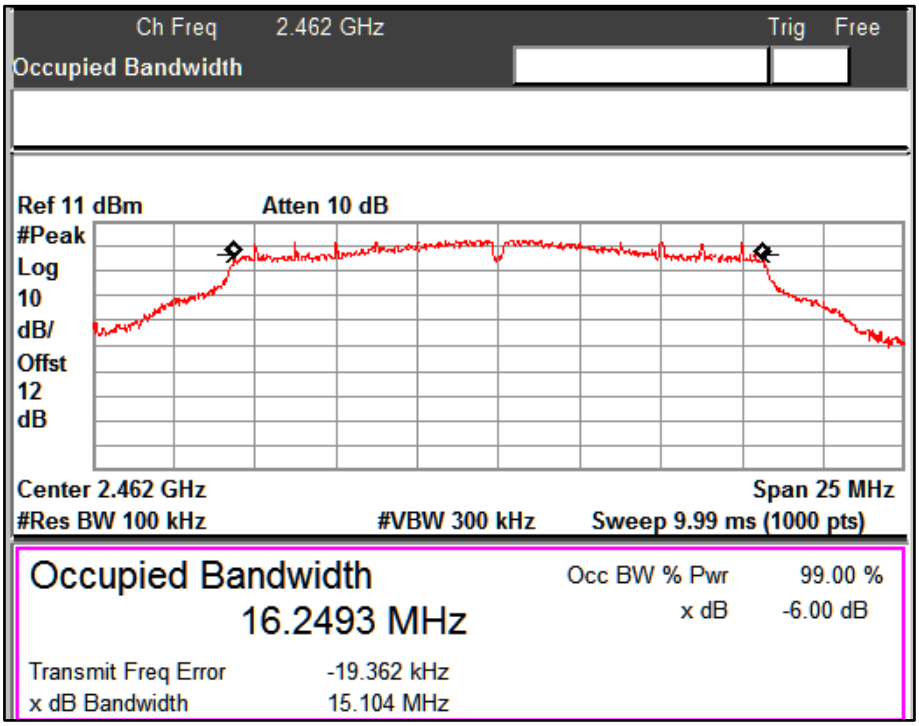
Mode	Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
802.11g	6	2412	16.303	16.395
		2442	15.303	16.285
		2462	15.104	16.249
	24	2412	16.002	16.340
		2442	15.186	16.291
		2462	16.017	16.348
	54	2412	15.727	16.331
		2442	15.653	16.285
		2462	15.187	16.245



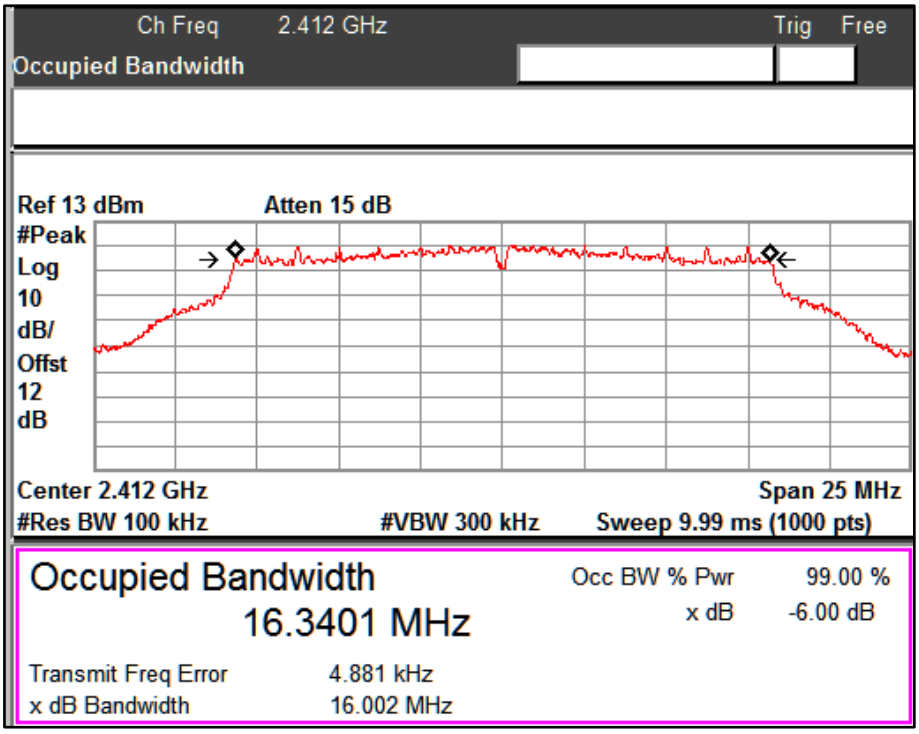
Data rate: 6Mbps Channel Frequency: 2412MHz



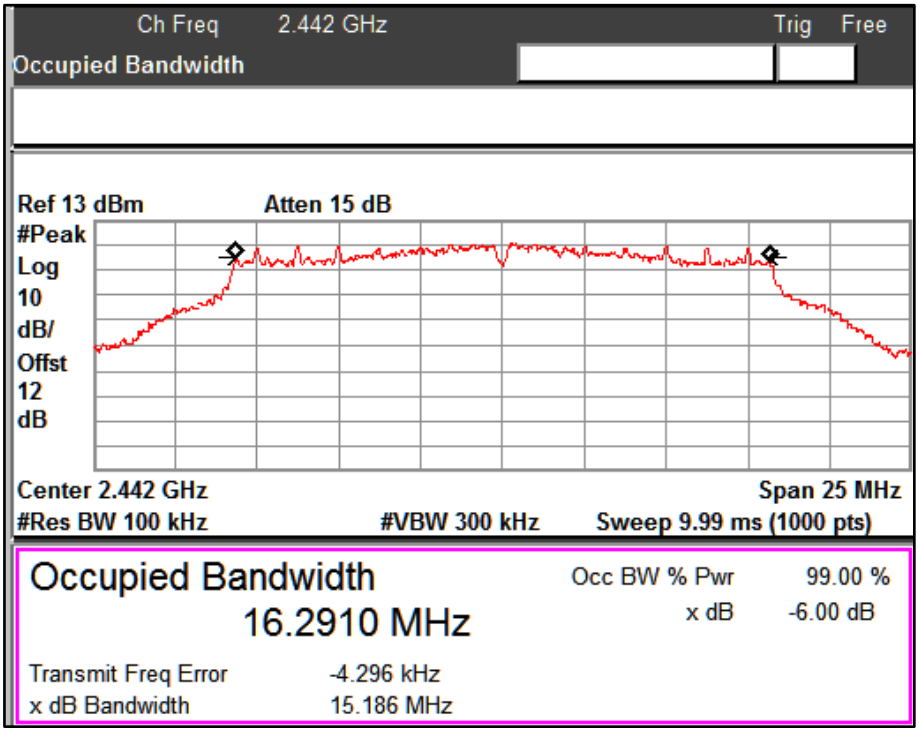
Data rate: 6Mbps Channel Frequency: 2442MHz



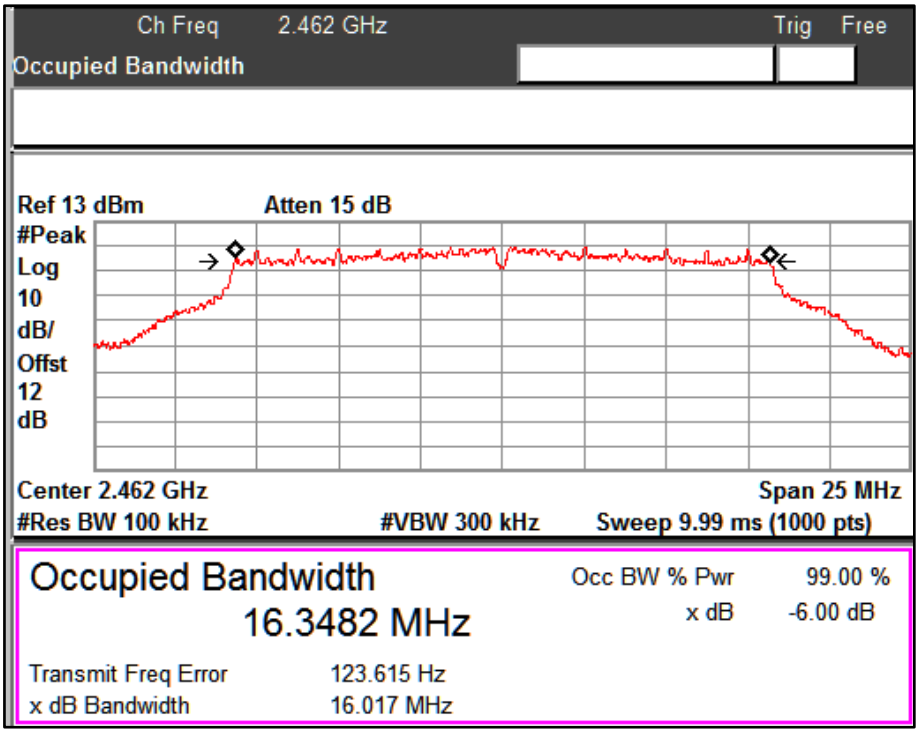
Data rate: 6Mbps Channel Frequency: 2462MHz



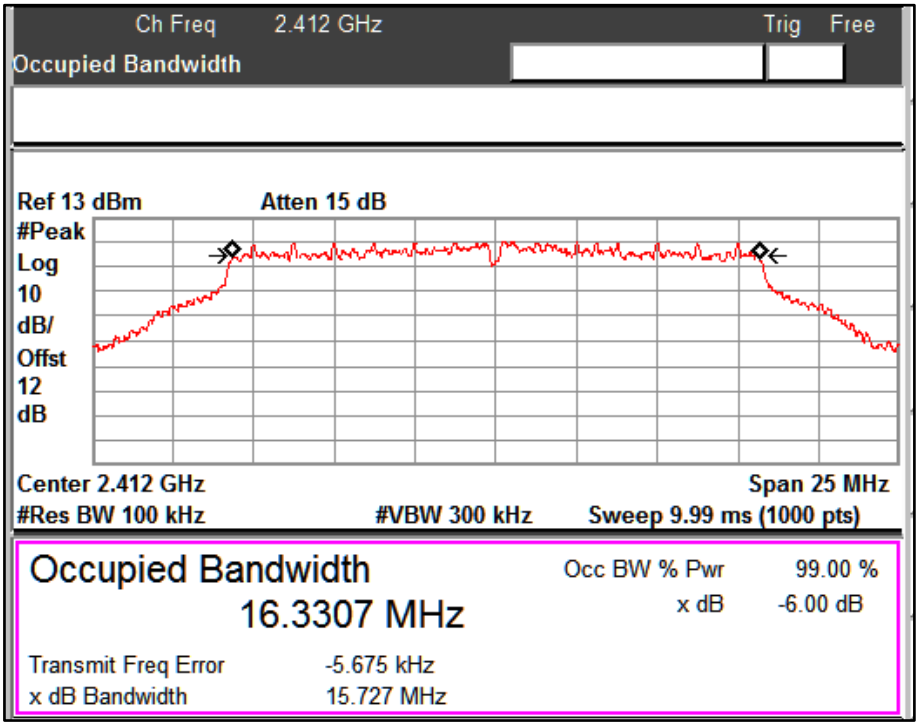
Data rate: 24Mbps Channel Frequency: 2412MHz



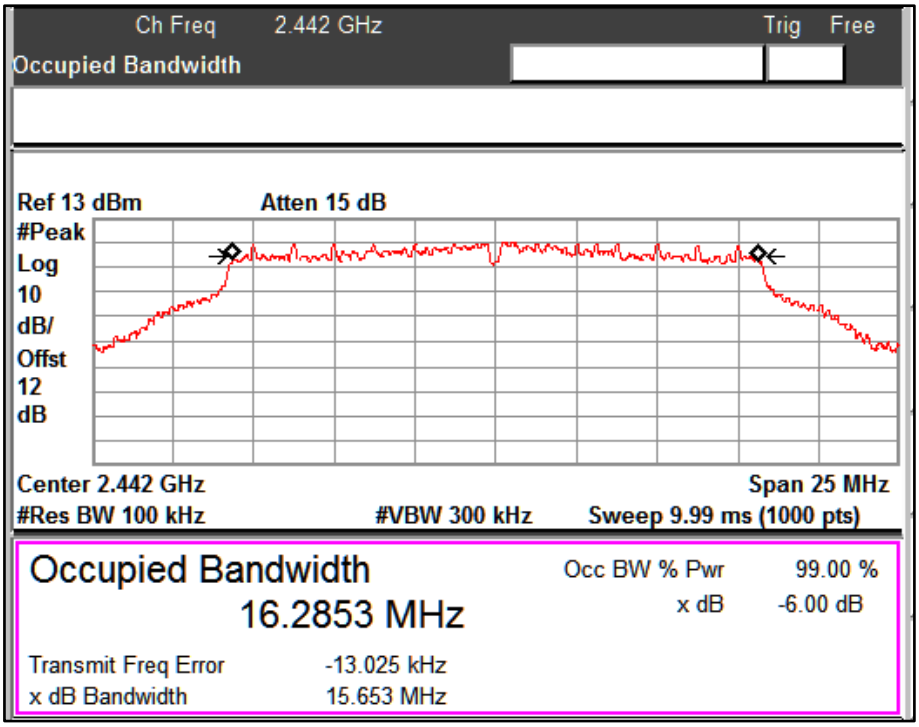
Data rate: 24Mbps Channel Frequency: 2442MHz



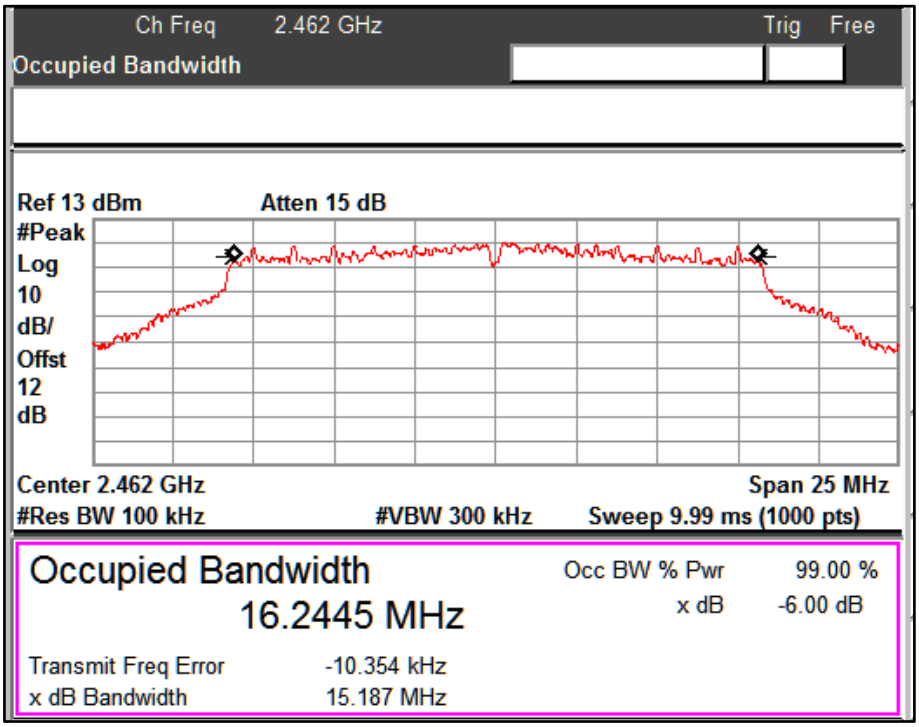
Data rate: 24Mbps Channel Frequency: 2462MHz



Data rate: 54Mbps Channel Frequency: 2412MHz

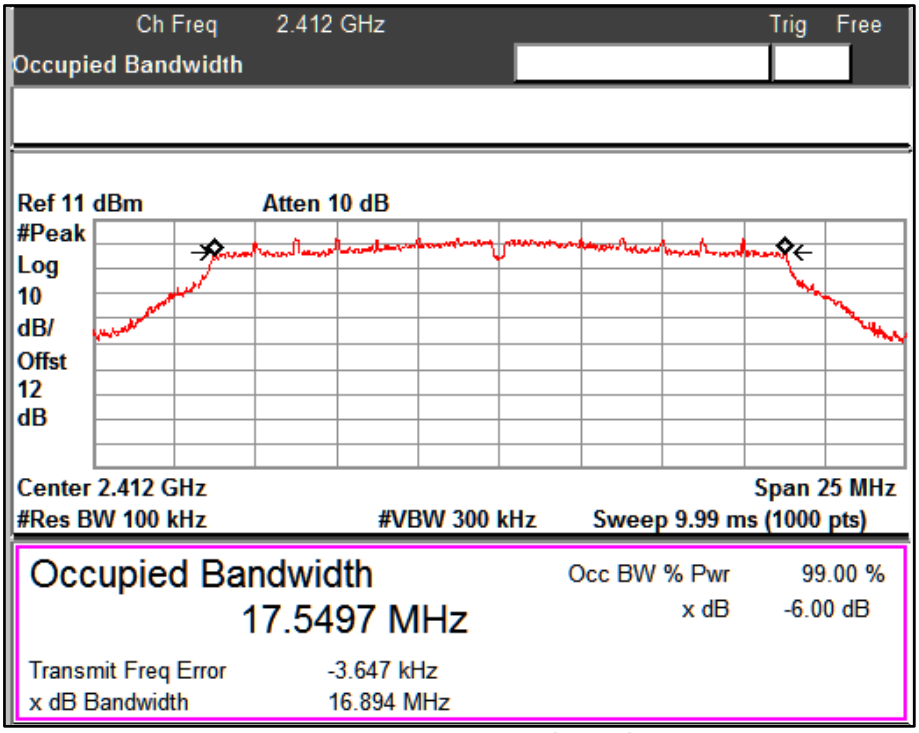


Data rate: 54Mbps Channel Frequency: 2442MHz

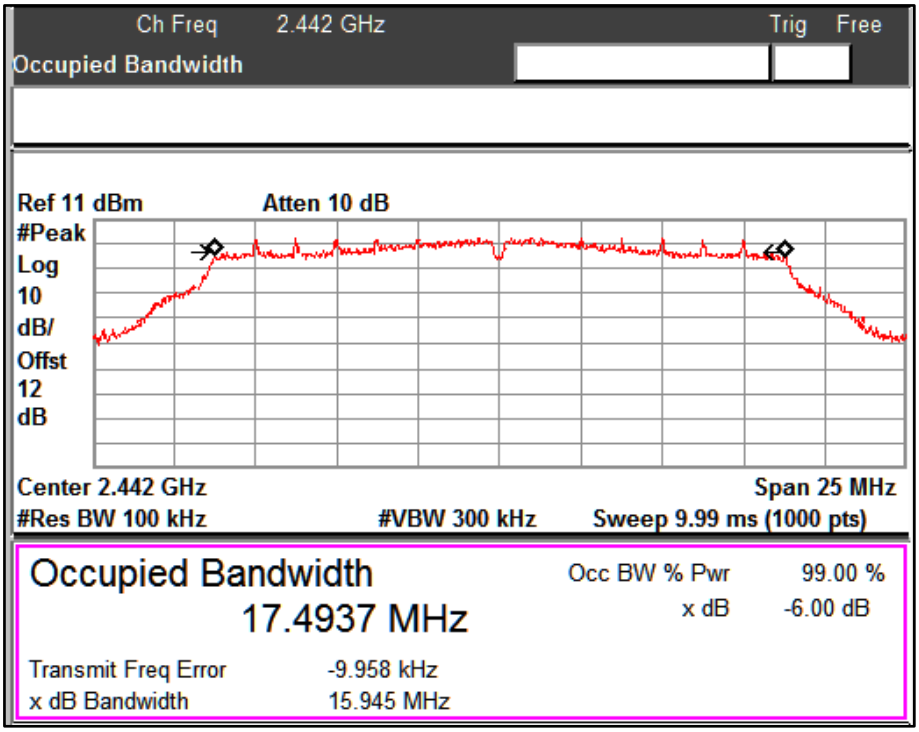


Data rate: 54Mbps Channel Frequency: 2462MHz

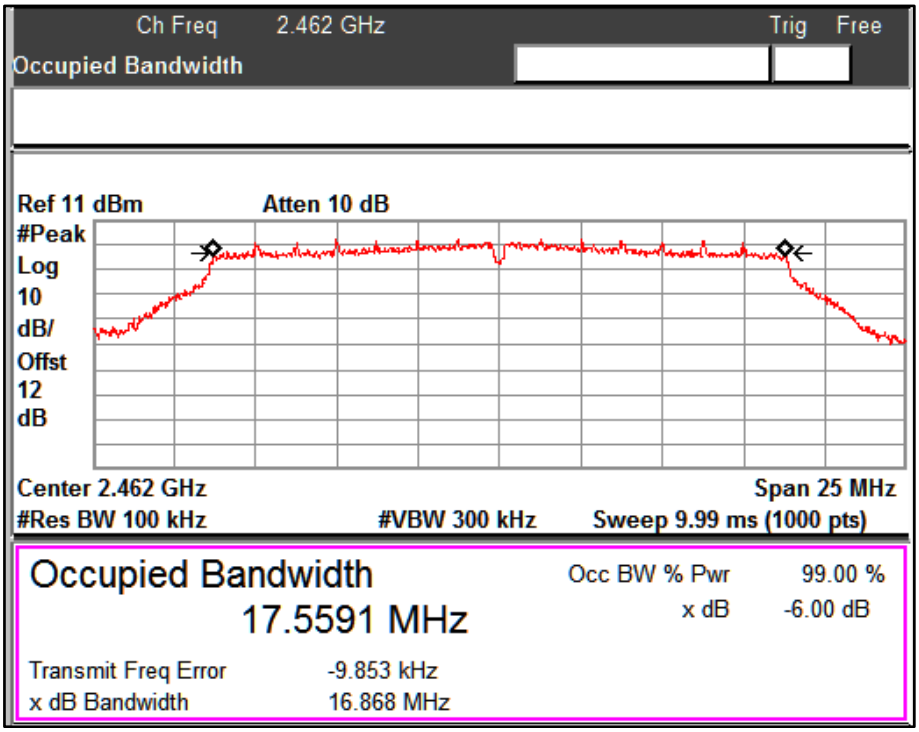
Mode	Data rate (Mbps)	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	99% OBW (MHz)
802.11n (20MHz)	MCS0	2412	16.894	17.550
		2442	15.945	17.494
		2462	16.868	17.559
	MCS4	2412	15.186	17.485
		2442	15.190	17.495
		2462	17.397	17.566
	MCS7	2412	17.568	17.590
		2442	17.541	17.541
		2462	16.921	17.526



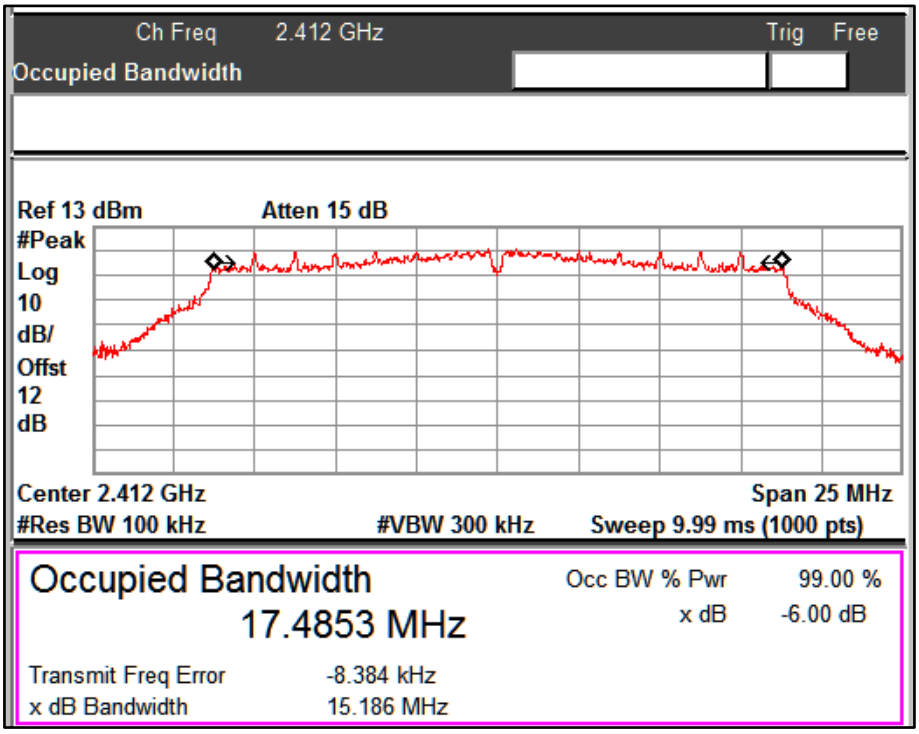
Data rate: MCS0 Channel Frequency: 2412MHz



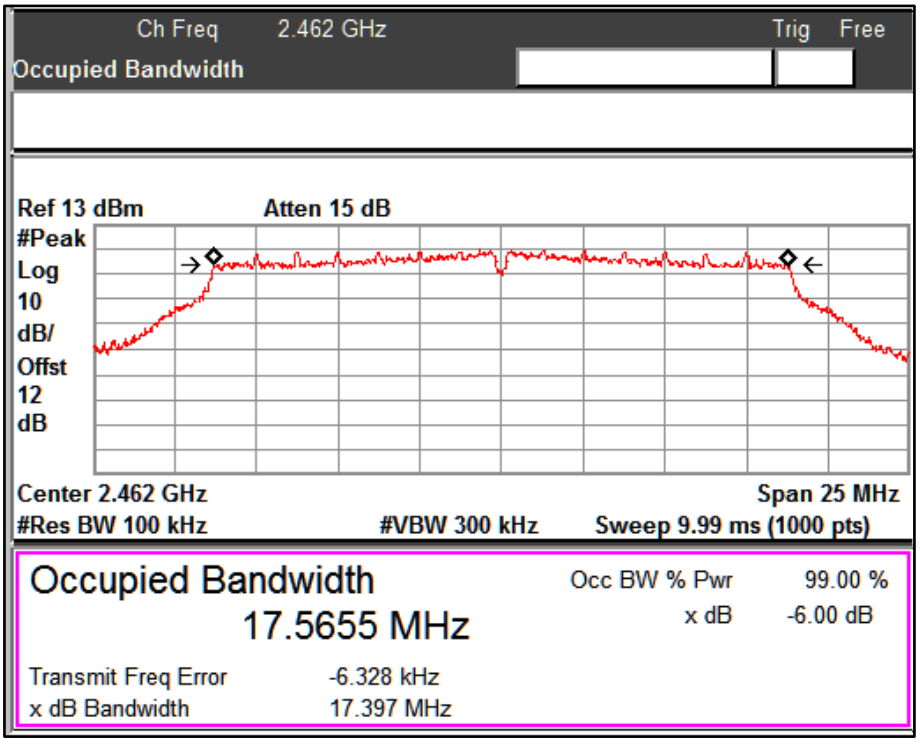
Data rate: MCS0 Channel Frequency: 2442MHz



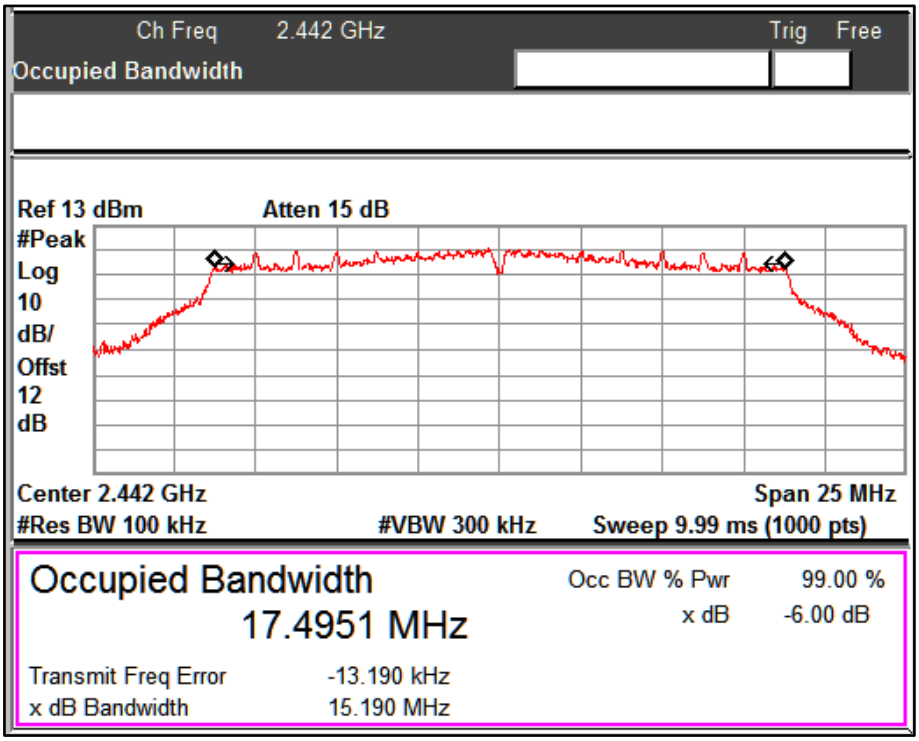
Data rate: MCS0 Channel Frequency: 2462MHz



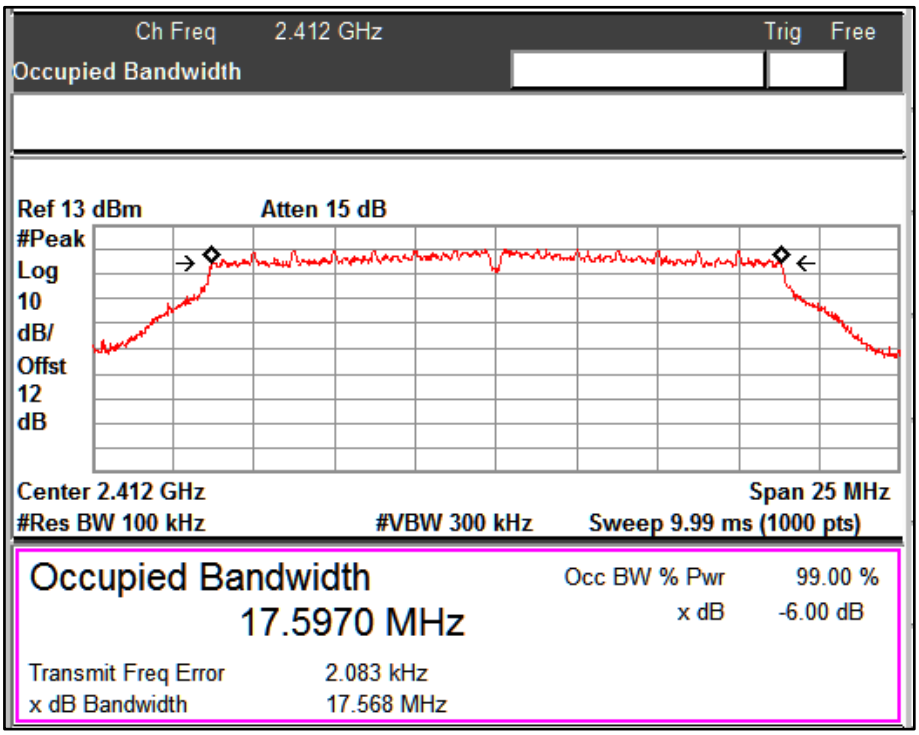
Data rate: MCS4 Channel Frequency: 2412MHz



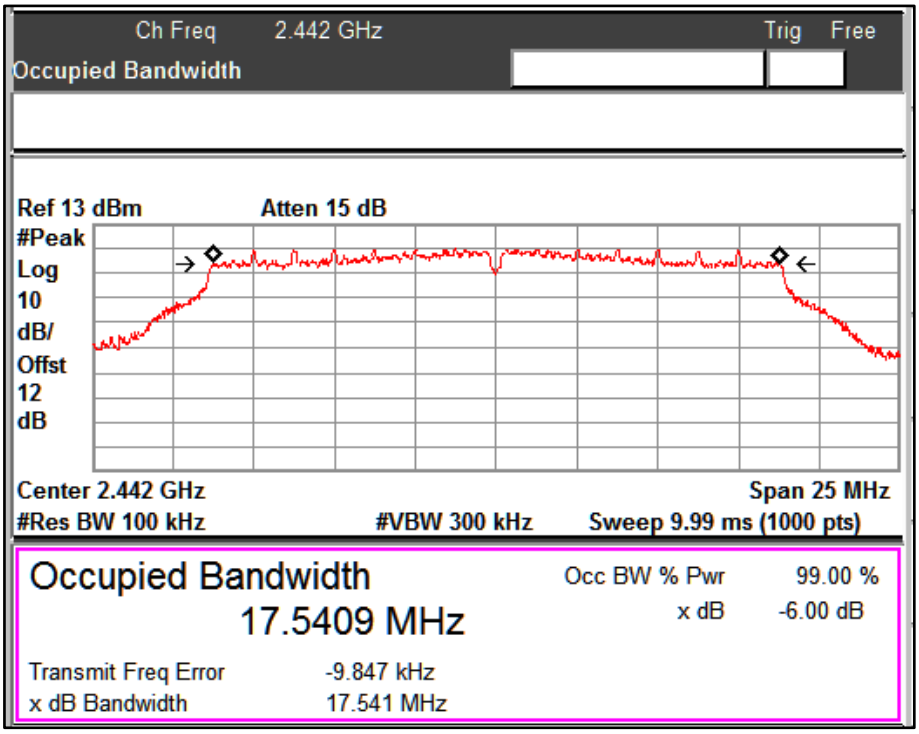
Data rate: MCS4 Channel Frequency: 2442MHz



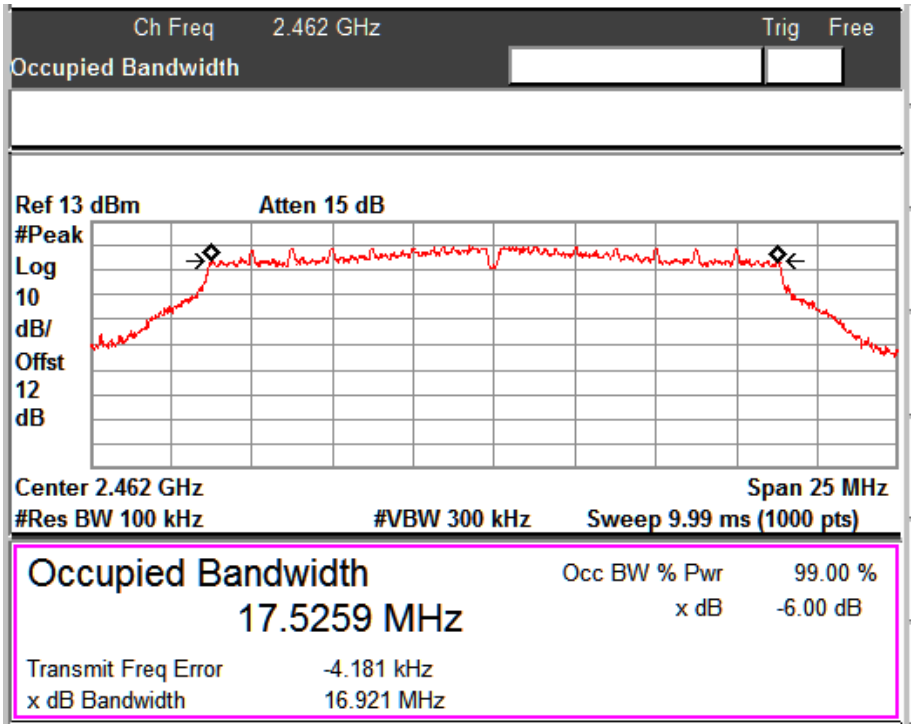
Data rate: MCS4 Channel Frequency: 2462MHz



Data rate: MCS7 Channel Frequency: 2412MHz



Data rate: MCS7 Channel Frequency: 2442MHz

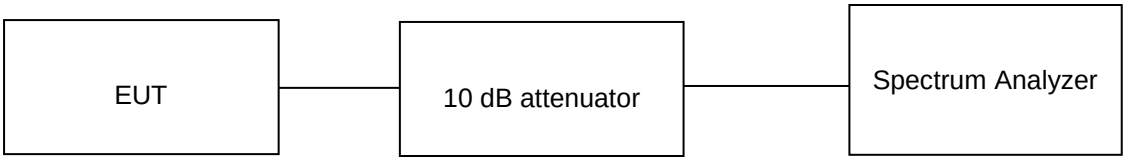


Data rate: MCS7 Channel Frequency: 2462MHz

6.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (d)
Detector Function	Peak
Port of testing	Antenna port
Requirement	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.



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

Test results:

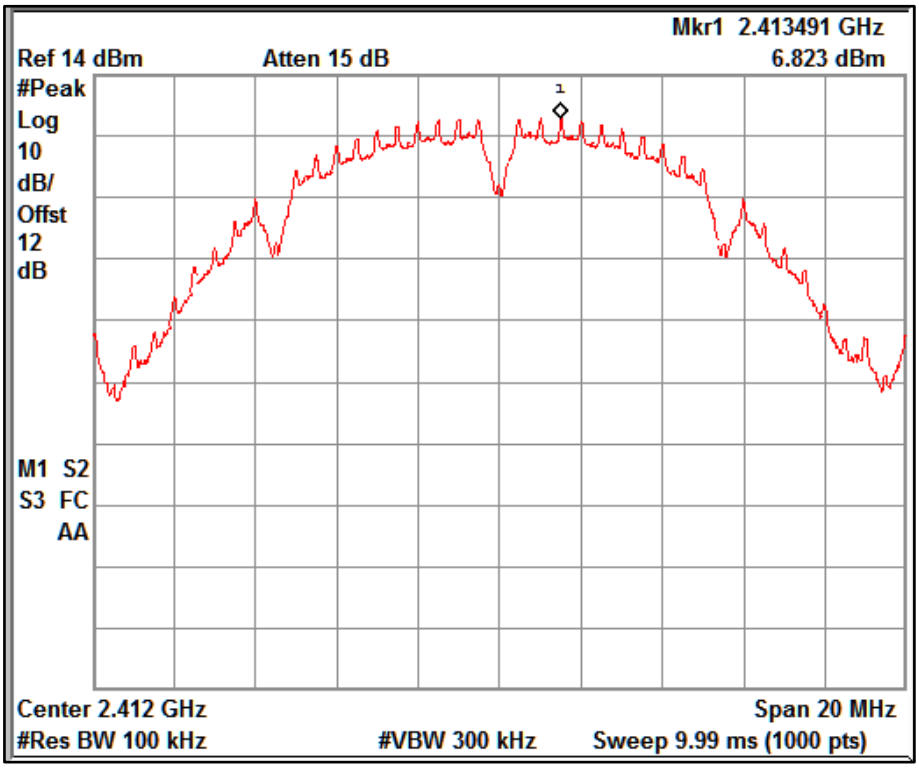
Note: Measurements were made as per section 8.5 in 558074 D01 15.247 Measurement Guidance v05r02.

10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below result

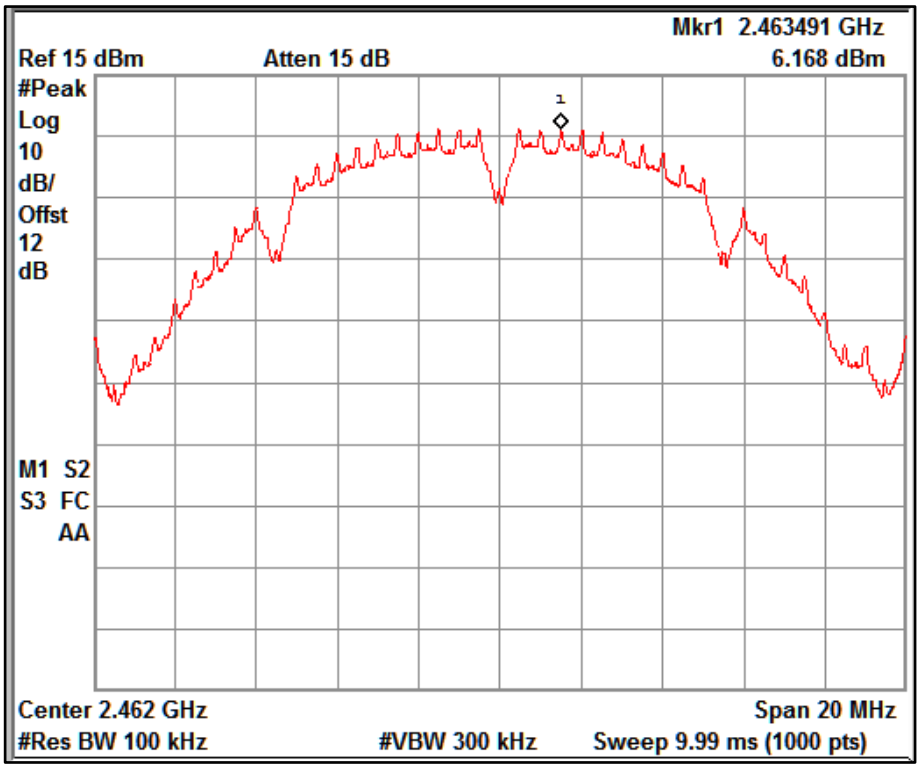
Table 13: Verified Test Results of Emissions in non-restricted frequency bands

Note: Testing was performed for both antennas and worst results of Antenna 1 is updated

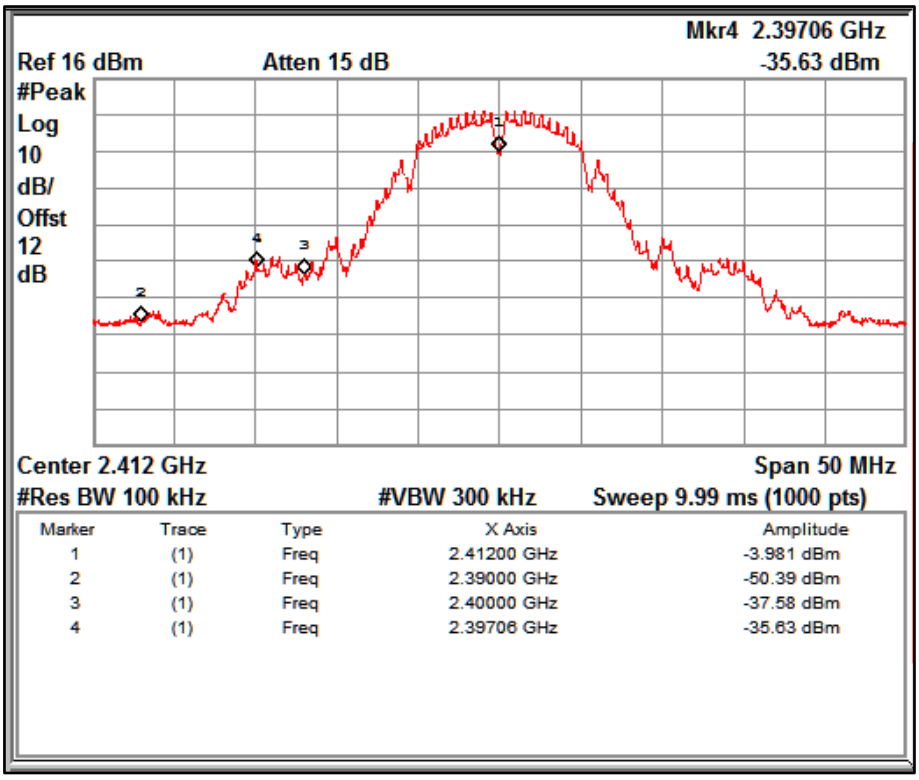
Data Mode	Data Rate (Mbps)	Channel Frequency (MHz)	Value at the Band Edge		Reference Value B (dBm)	Band Edge Value A~B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
b	1	2412	2400	-35.63	6.823	-42.453	20
		2462	2483.5	-47.63	6.168	-53.798	20



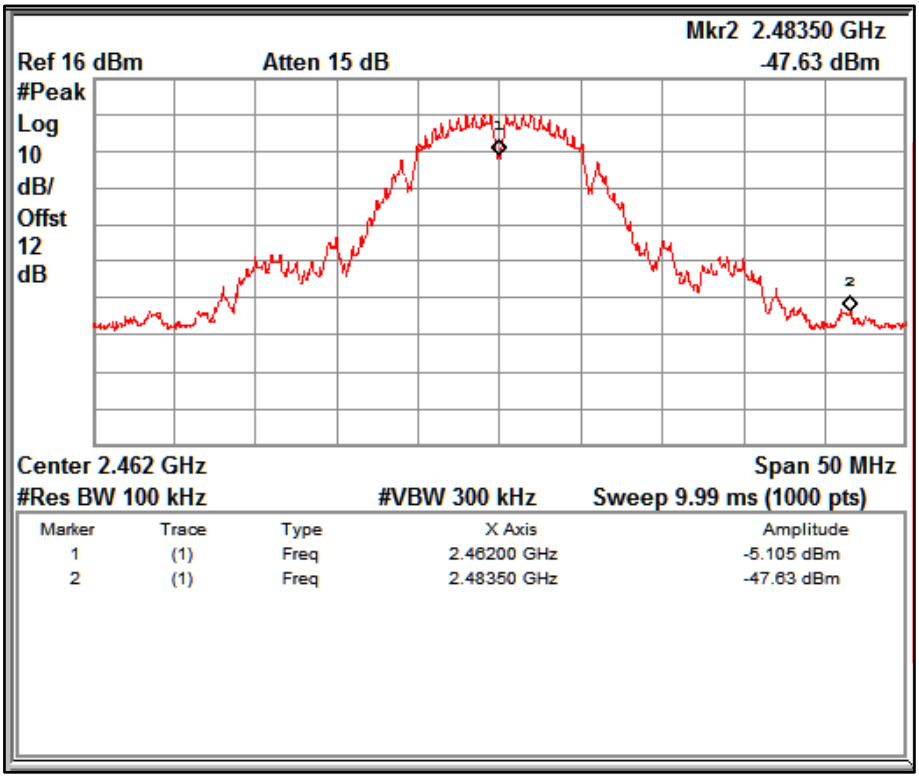
Reference Plot: 1Mbps, 2412MHz



Reference Plot: 1Mbps, 2462MHz

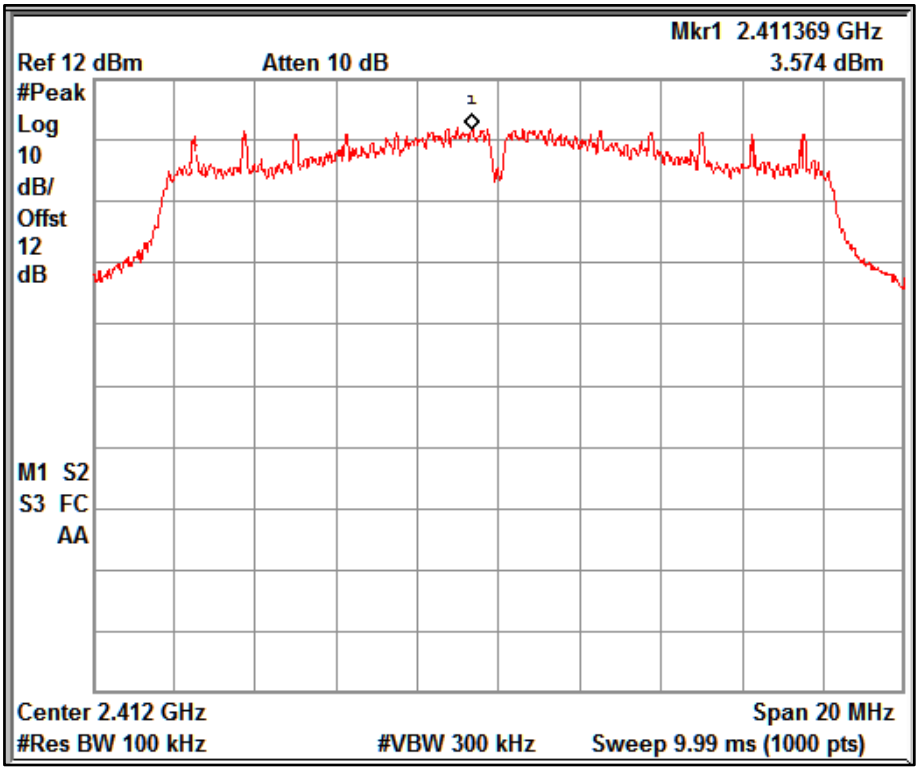


Data rate: 1Mbps Channel Frequency: 2412MHz

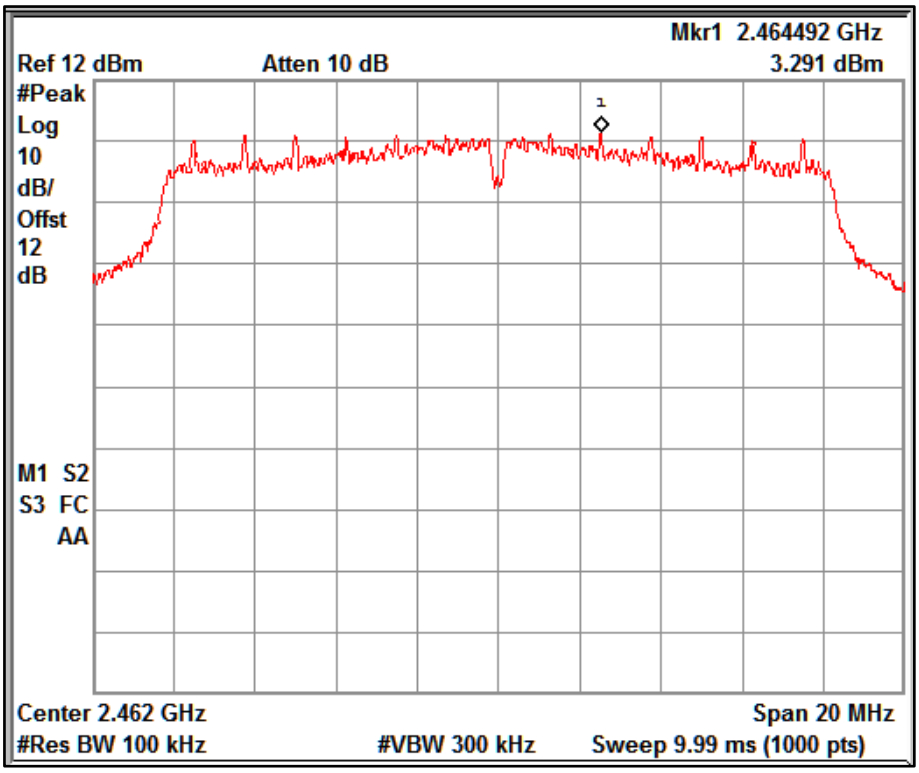


Data rate: 1Mbps Channel Frequency: 2412MHz

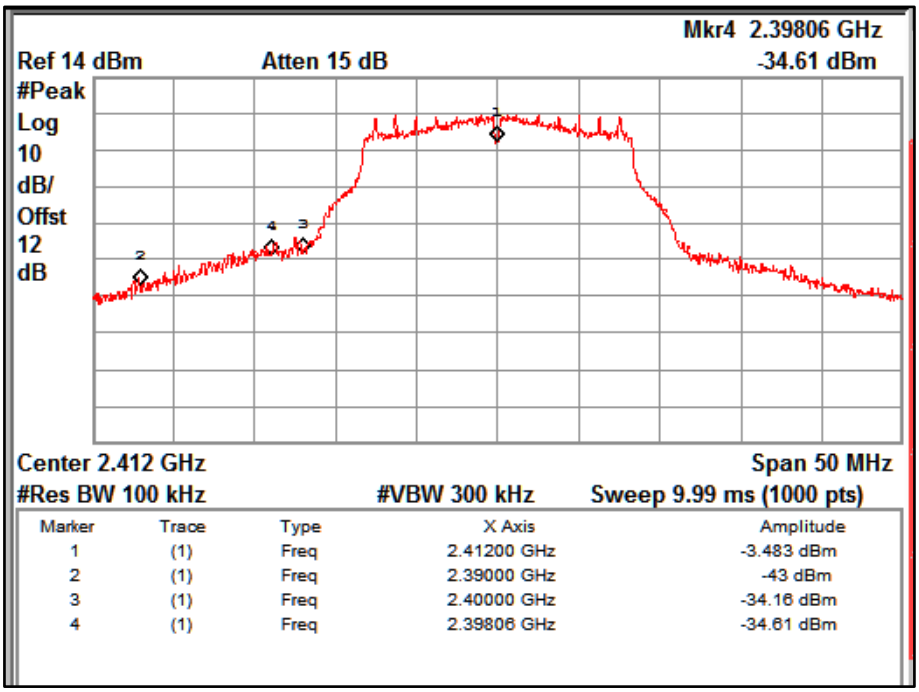
Data Mode	Data Rate (Mbps)	Channel Frequency (MHz)	Value at the Band Edge		Reference Value B (dBm)	Band Edge Value A~B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
g	6	2412	2400	-34.16	3.574	-37.734	20
		2462	2483.5	-40.9	3.291	-44.191	20



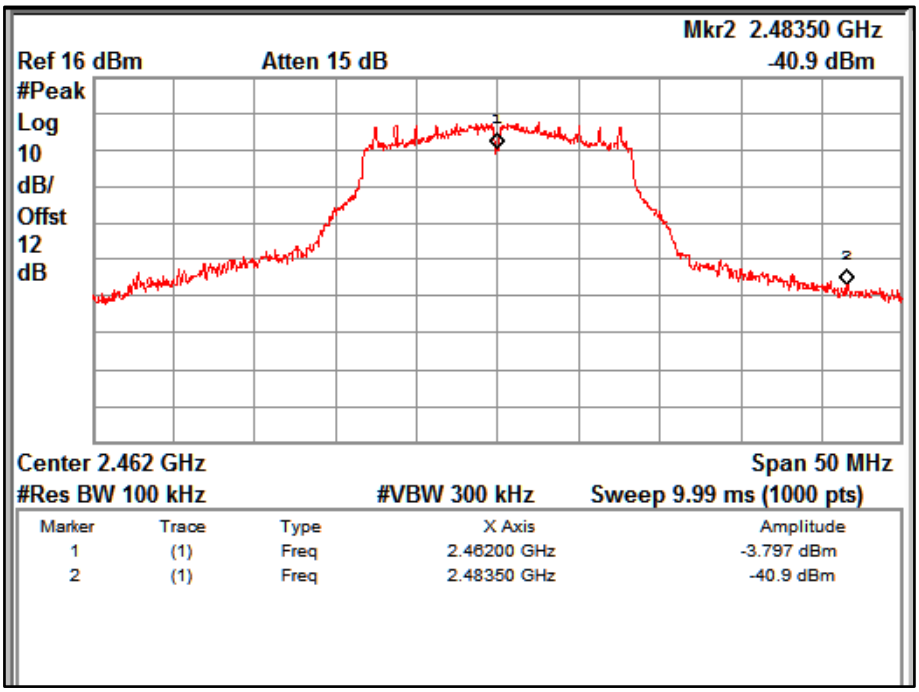
Reference Plot: 6Mbps, 2412MHz



Reference Plot: 6Mbps, 2462MHz

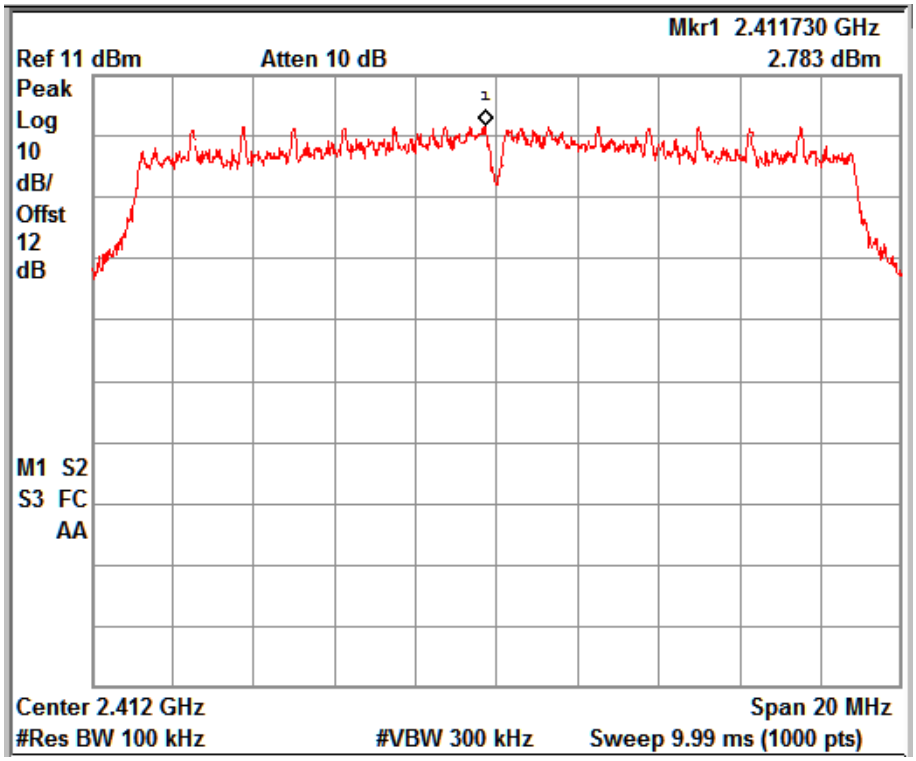


Data rate: 6Mbps Channel Frequency: 2412MHz

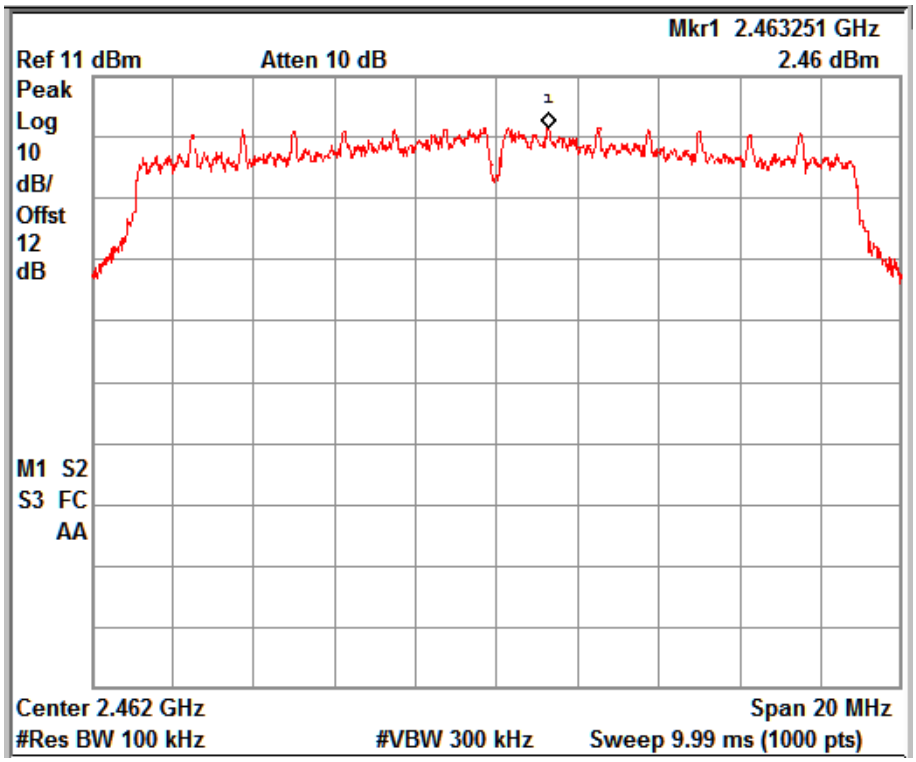


Data rate: 6Mbps Channel Frequency: 2462MHz

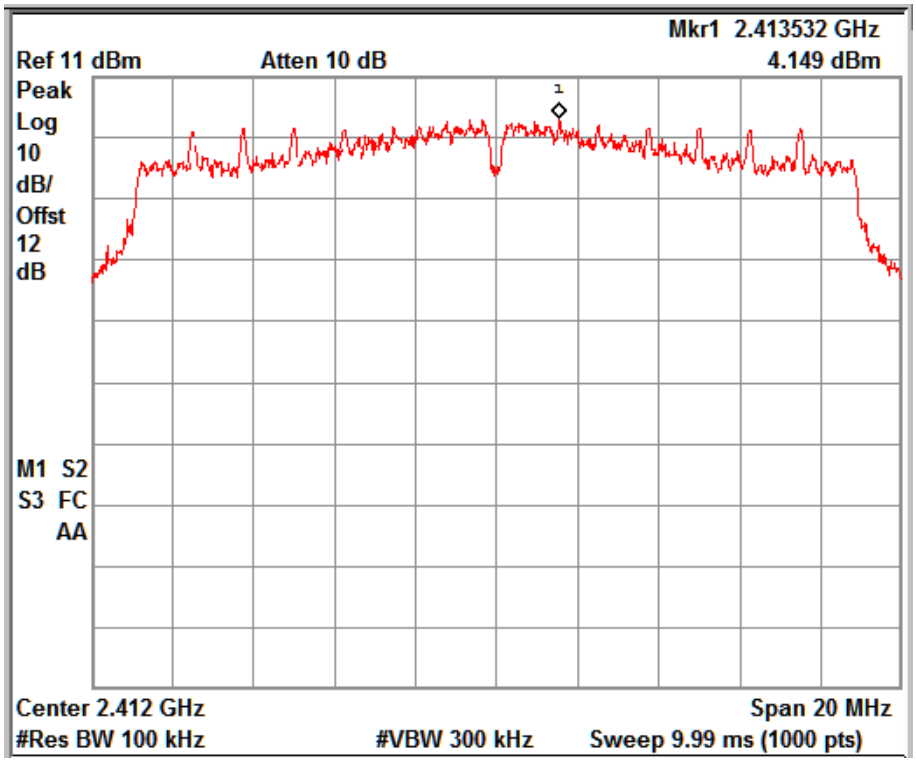
Data Mode	Data Rate (Mbps)	Channel Frequency (MHz)	Value at the Band Edge		Reference Value B (dBm)	Band Edge Value A~B (dBc)	Limit (dBc)
			Frequency (MHz)	Value A (dBm)			
802.11n (20MHz)	MCS4	2412	2400	-34.99	2.783	-37.773	20
		2462	2483.5	-43.75	2.460	-46.210	20



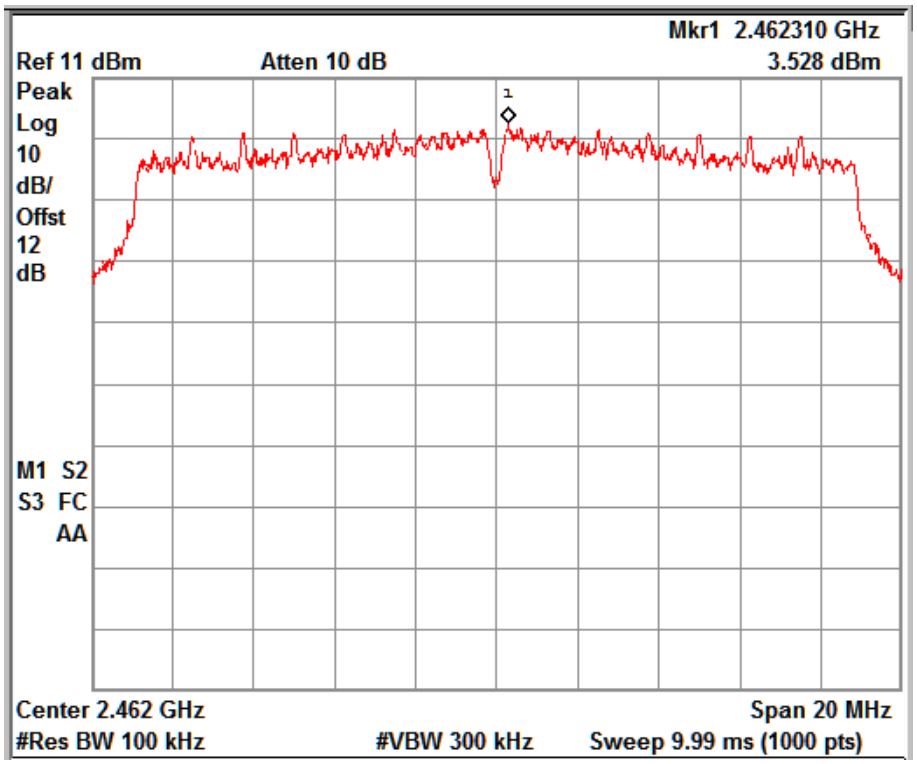
Reference Plot: MCS4, 2412MHz



Reference Plot: MCS4, 2462MHz



Data rate: MCS4 Channel Frequency: 2412MHz



Data rate: MCS4 Channel Frequency: 2462MHz

6.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247(d) / (15.209 & 15.205)
Test Method	ANSI C 63.10 - 2013
Measurement Location	Semi Anechoic Chamber < 1 GHz Fully Anechoic Chamber > 1 GHz
Measuring Distance	3 m
Detector	QP for frequency below 1 GHz, average for frequency above 1 GHz
Requirement	As per the limits mentioned in the below table

Table 14: Transmitter limits for Radiated emission

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 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/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.

Test Conditions:

Supply Voltage: 110 V AC, 60Hz
Supply Voltage for Module: 24 V DC

Environmental conditions:

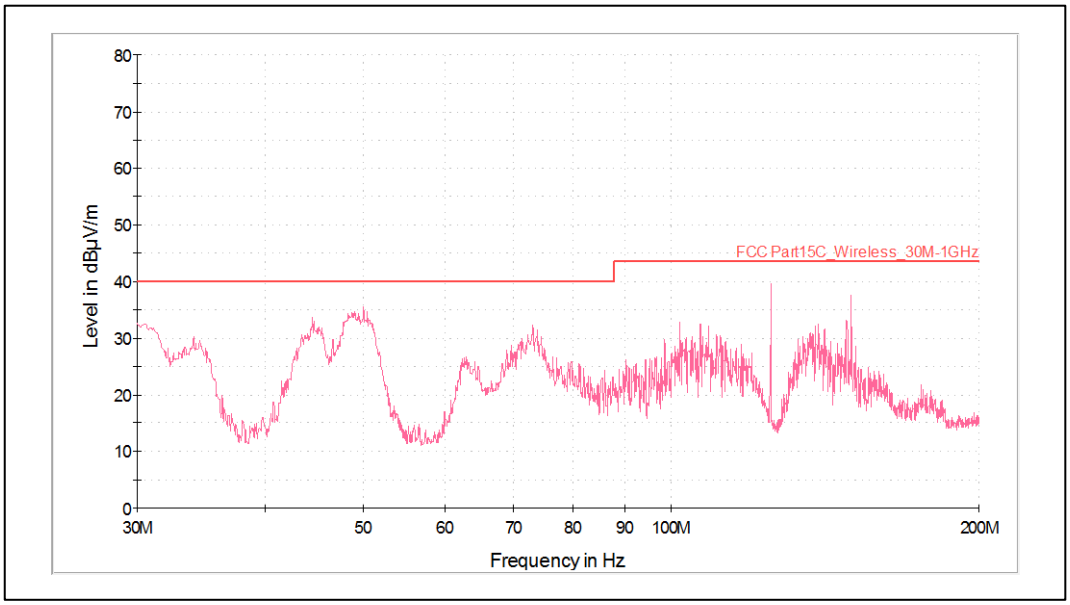
Temperature: +23.5 °C RH: 54 %

Test results:

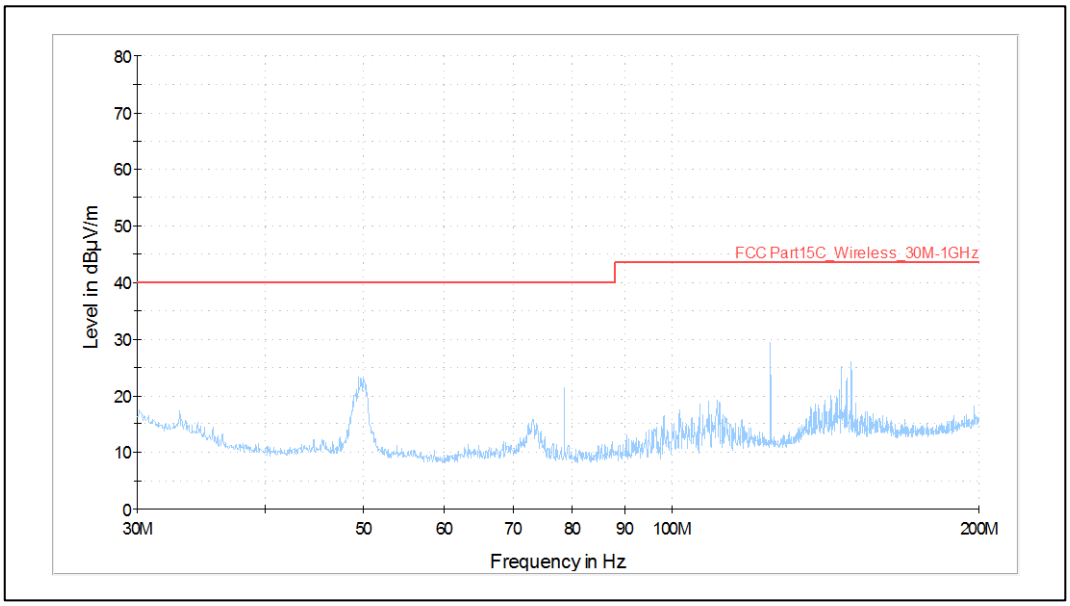
No Emissions found in the frequency range 9kHz – 30MHz

Power Mode: RS232

Frequency range : 30MHz – 200MHz



Polarization: Vertical

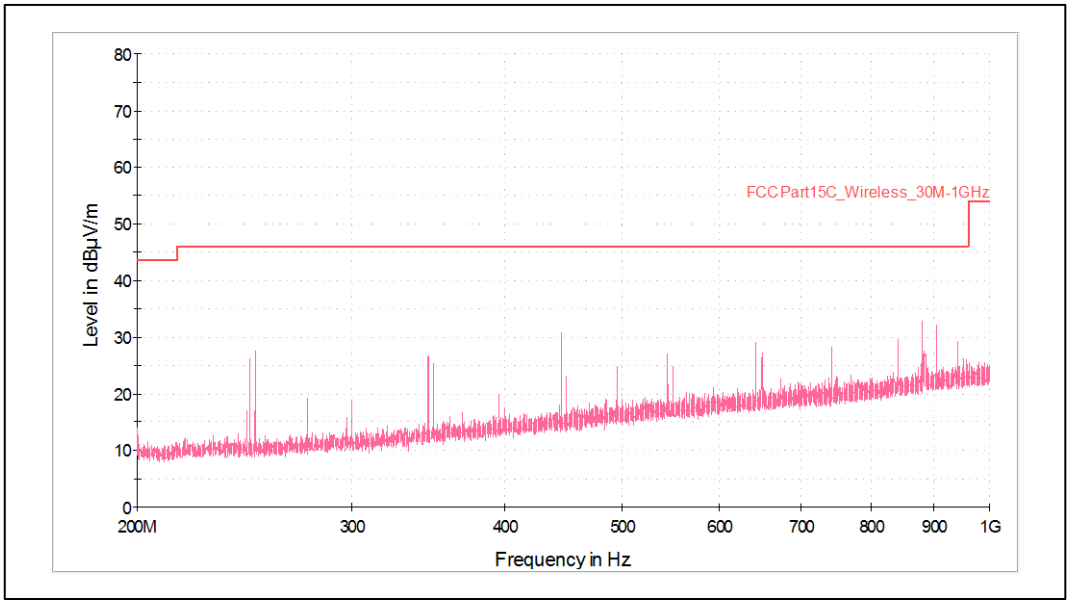


Polarization: Horizontal

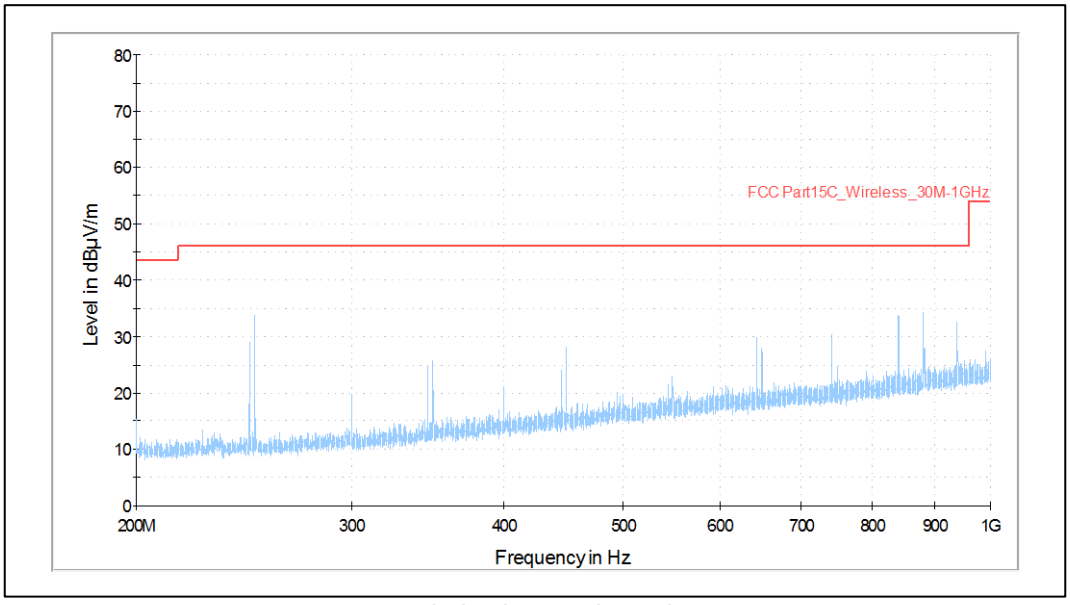
Test results:

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	30.60	29.50	40.00	7.57
Vertical	49.97	31.36	40.00	4.43
Vertical	73.16	29.22	40.00	7.83
Horizontal	78.51	4.62	40.00	18.38
Horizontal	124.95	27.07	43.50	14.86
Vertical	125.01	38.36	43.50	3.72
Vertical	149.97	35.88	43.50	5.93

Frequency range : 200MHz – 1GHz



Polarization: Vertical



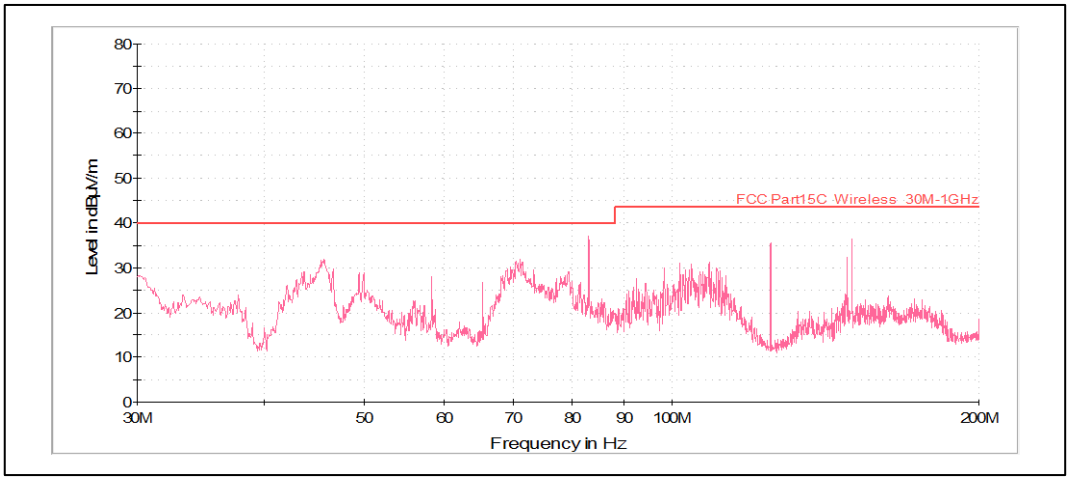
Polarization: Horizontal

Test result :

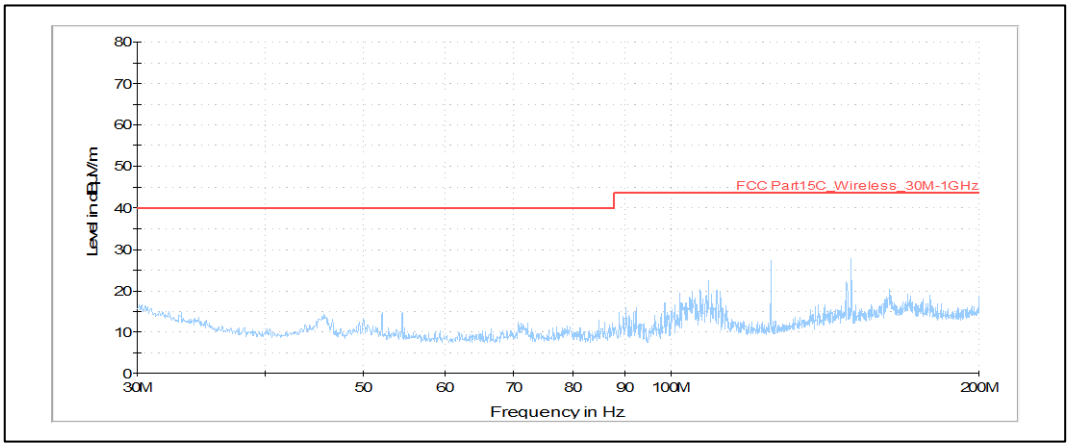
Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Horizontal	250.00	33.73	46.00	12.27
Vertical	445.50	27.44	46.00	18.56
Horizontal	841.50	33.83	46.00	12.17
Horizontal	880.60	32.13	46.00	13.87
Vertical	903.55	19.21	46.00	26.79
Horizontal	940.50	30.00	46.00	16.00

Power Mode: 24V DC

Frequecy range: 30MHz – 200MHz



Polarization: Vertical

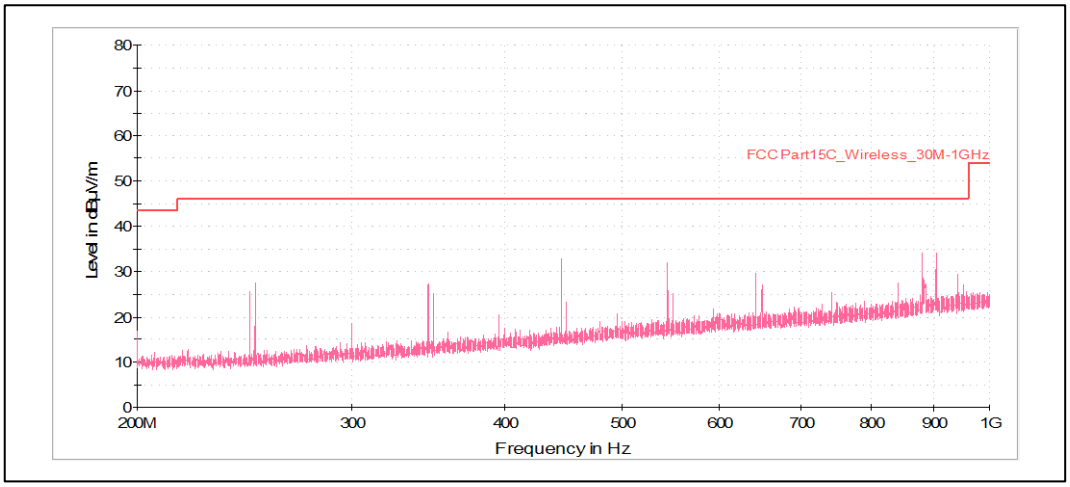


Polarization: Horizontal

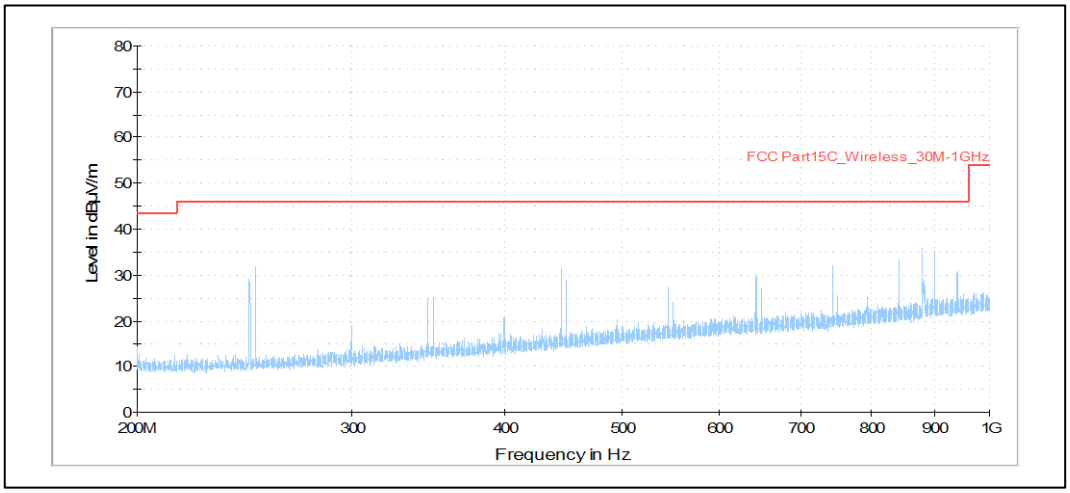
Test results :

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	45.42	24.92	40.00	15.08
Vertical	83.12	17.21	40.00	22.79
Horizontal	124.95	24.11	43.50	19.39
Vertical	125.01	33.59	43.50	9.91
Vertical	148.51	30.58	43.50	12.92
Horizontal	149.97	25.48	43.50	18.02
Vertical	150.03	33.28	43.50	10.22

Frequency range : 200MHz – 1GHz



Polarization: Vertical



Polarization: Horizontal

Test results :

Antenna Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	247.45	21.48	46.00	24.52
Horizontal	247.50	28.56	46.00	17.44
Vertical	249.95	19.44	46.00	26.56
Horizontal	250.00	32.22	46.00	13.78
Horizontal	880.60	32.81	46.00	13.19

Frequency range: 1GHz to 26GHz

Antenna 1

802.11b: 1Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	54.48	74	-19.52
	2390(Av)		42.07	54	-11.93
	2412(Pk)		102.40	*	-
	2412(Av)		99.76	*	-
	4824(Pk)		44.45	74	-29.55
	4824(Av)		37.03	54	-16.97
	7236(Pk)		47.28	74	-26.72
	7236(Av)		34.24	54	-19.76
	2390(Pk)	Horizontal	55.74	74	-18.26
	2390(Av)		42.62	54	-11.38
	2412(Pk)		103.53	*	-
	2412(Av)		100.95	*	-
	4824(Pk)		43.25	74	-30.75
	4824(Av)		34.86	54	-19.14
	7236(Pk)		47.64	74	-26.36
	7236(Av)		34.20	54	-19.80
2442	2442(Pk)	Vertical	102.37	*	-
	2442(Av)		99.90	*	-
	4884(Pk)		44.09	74	-29.91
	4884(Av)		35.68	54	-18.32
	7326(Pk)		48.05	74	-25.95
	7326(Av)		35.66	54	-18.34
	2442(Pk)	Horizontal	101.32	*	-
	2442(Av)		98.75	*	-
	4884(Pk)		44.47	74	-29.53
	4884(Av)		37.99	54	-16.01
	7326(Pk)		48.28	74	-25.72
	7326(Av)		35.16	54	-18.84

802.11b: 1Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2462	2462(Pk)	Vertical	96.61	*	-
	2462(Av)		93.70	*	-
	2483.5(Pk)		47.30	74	-26.71
	2483.5(Av)		36.68	54	-17.32
	4924(Pk)		45.12	74	-28.88
	4924(Av)		39.12	54	-14.88
	7386(Pk)		48.71	74	-25.29
	7386(Av)		38.22	54	-15.78
	2462(Pk)	Horizontal	100.44	*	-
	2462(Av)		97.67	*	-
	2483.5(Pk)		51.10	74	-22.90
	2483.5(Av)		40.35	54	-13.65
	4924(Pk)		45.28	74	-28.72
	4924(Av)		39.45	54	-14.55
	7386(Pk)		48.98	74	-25.02
	7386(Av)		39.24	54	-14.76

802.11b: 11Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	56.06	74	-17.94
	2390(Av)		42.18	54	-11.82
	2412(Pk)		108.11	*	-
	2412(Av)		99.49	*	-
	4824(Pk)		43.08	74	-30.92
	4824(Av)		30.40	54	-23.60
	7236(Pk)		47.16	74	-26.84
	7236(Av)		34.00	54	-20.00
	2390(Pk)	Horizontal	53.84	74	-20.16
	2390(Av)		41.77	54	-12.23
	2412(Pk)		106.41	*	-
	2412(Av)		97.67	*	-
	4824(Pk)		42.68	74	-31.32
	4824(Av)		29.93	54	-24.07
	7236(Pk)		47.60	74	-26.40
	7236(Av)		34.05	54	-19.95
2442	2442(Pk)	Vertical	107.88	*	-
	2442(Av)		99.22	*	-
	4884(Pk)		43.67	74	-30.33
	4884(Av)		30.86	54	-23.14
	7326(Pk)		48.05	74	-25.95
	7326(Av)		34.93	54	-19.07
	2442(Pk)	Horizontal	106.95	*	-
	2442(Av)		98.34	*	-
	4884(Pk)		44.57	74	-29.43
	4884(Av)		32.22	54	-21.78
	7326(Pk)		47.48	74	-26.52
	7326(Av)		34.46	54	-19.54
2462	2462(Pk)	Vertical	105.84	*	-
	2462(Av)		95.16	*	-
	2483.5(Pk)		54.32	74	-19.68
	2483.5(Av)		41.61	54	-12.39
	4924(Pk)		45.20	74	-28.80
	4924(Av)		31.20	54	-22.80
	7386(Pk)		49.99	74	-24.01
	7386(Av)		37.88	54	-16.12
	2462(Pk)	Horizontal	104.56	*	-
	2462(Av)		96.04	*	-
	2483.5(Pk)		53.83	74	-20.17
	2483.5(Av)		41.58	54	-12.42
	4924(Pk)		44.53	74	-29.47
	4924(Av)		31.56	54	-22.44
	7386(Pk)		49.92	74	-24.08
	7386(Av)		36.96	54	-17.04

802.11g: 6Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	68.14	74	-5.86
	2390(Av)		51.23	54	-2.77
	2412(Pk)		106.75	*	-
	2412(Av)		97.70	*	-
	4824(Pk)		41.99	74	-32.01
	4824(Av)		29.44	54	-24.56
	7236(Pk)		47.87	74	-26.13
	7236(Av)		34.10	54	-19.90
	2390(Pk)	Horizontal	66.63	74	-7.37
	2390(Av)		50.01	54	-3.99
	2412(Pk)		106.34	*	-
	2412(Av)		97.14	*	-
	4824(Pk)		41.93	74	-32.07
	4824(Av)		29.33	54	-24.67
	7236(Pk)		47.11	74	-26.89
	7236(Av)		34.09	54	-19.91
2442	2442(Pk)	Vertical	107.25	*	-
	2442(Av)		98.24	*	-
	4884(Pk)		42.73	74	-31.27
	4884(Av)		29.88	54	-24.12
	7326(Pk)		49.91	74	-24.09
	7326(Av)		35.63	54	-18.37
	2442(Pk)	Horizontal	106.21	*	-
	2442(Av)		97.33	*	-
	4884(Pk)		43.46	74	-30.54
	4884(Av)		30.93	54	-23.07
	7326(Pk)		47.61	74	-26.39
	7326(Av)		34.81	54	-19.19
2462	2462(Pk)	Vertical	104.92	*	-
	2462(Av)		95.71	*	-
	2483.5(Pk)		67.21	74	-6.79
	2483.5(Av)		50.13	54	-3.87
	4924(Pk)		42.97	74	-31.03
	4924(Av)		30.08	54	-23.92
	7386(Pk)		50.66	74	-23.34
	7386(Av)		37.73	54	-16.27
	2462(Pk)	Horizontal	105.87	*	-
	2462(Av)		96.77	*	-
	2483.5(Pk)		68.49	74	-5.51
	2483.5(Av)		50.29	54	-3.72
	4924(Pk)		43.82	74	-30.18
	4924(Av)		30.72	54	-23.28
	7386(Pk)		52.68	74	-21.32
	7386(Av)		37.51	54	-16.49

802.11g: 24Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	62.87	74	-11.13
	2390(Av)		48.48	54	-5.52
	2412(Pk)		106.91	*	-
	2412(Av)		95.92	*	-
	4824(Pk)		42.20	74	-31.80
	4824(Av)		29.16	54	-24.84
	7236(Pk)		47.05	74	-26.95
	7236(Av)		34.16	54	-19.84
	2390(Pk)	Horizontal	61.80	74	-12.20
	2390(Av)		48.00	54	-6.00
	2412(Pk)		106.80	*	-
	2412(Av)		96.04	*	-
	4824(Pk)		42.26	74	-31.74
	4824(Av)		29.10	54	-24.90
	7236(Pk)		47.94	74	-26.06
	7236(Av)		34.08	54	-19.92
2442	2442(Pk)	Vertical	106.97	*	-
	2442(Av)		95.90	*	-
	4884(Pk)		42.70	74	-31.30
	4884(Av)		29.55	54	-24.45
	7326(Pk)		47.36	74	-26.64
	7326(Av)		35.16	54	-18.84
	2442(Pk)	Horizontal	106.01	*	-
	2442(Av)		95.12	*	-
	4884(Pk)		42.99	74	-31.01
	4884(Av)		29.89	54	-24.11
	7326(Pk)		48.53	74	-25.47
	7326(Av)		34.60	54	-19.40
2462	2462(Pk)	Vertical	105.21	*	-
	2462(Av)		94.32	*	-
	2483.5(Pk)		63.06	74	-10.94
	2483.5(Av)		48.54	54	-5.46
	4924(Pk)		43.51	74	-30.49
	4924(Av)		30.93	54	-23.07
	7386(Pk)		49.29	74	-24.71
	7386(Av)		35.85	54	-18.15
	2462(Pk)	Horizontal	104.57	*	-
	2462(Av)		93.89	*	-
	2483.5(Pk)		61.90	74	-12.10
	2483.5(Av)		46.34	54	-7.66
	4924(Pk)		43.49	74	-30.51
	4924(Av)		30.38	54	-23.62
	7386(Pk)		50.97	74	-23.03
	7386(Av)		36.91	54	-17.09

802.11g: 54Mbps

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	63.83	74	-10.17
	2390(Av)		48.58	54	-5.42
	2412(Pk)		106.40	*	-
	2412(Av)		93.95	*	-
	4824(Pk)		40.78	74	-33.22
	4824(Av)		29.23	54	-24.77
	7236(Pk)		47.57	74	-26.43
	7236(Av)		34.09	54	-19.91
	2390(Pk)	Horizontal	62.14	74	-11.86
	2390(Av)		45.43	54	-8.57
	2412(Pk)		106.61	*	-
	2412(Av)		93.71	*	-
	4824(Pk)		42.25	74	-31.75
	4824(Av)		28.90	54	-25.10
	7236(Pk)		47.69	74	-26.31
	7236(Av)		34.11	54	-19.89
2442	2442(Pk)	Vertical	106.91	*	-
	2442(Av)		94.48	*	-
	4884(Pk)		42.83	74	-31.17
	4884(Av)		29.65	54	-24.35
	7326(Pk)		48.55	74	-25.45
	7326(Av)		34.80	54	-19.20
	2442(Pk)	Horizontal	106.10	*	-
	2442(Av)		93.77	*	-
	4884(Pk)		43.09	74	-30.91
	4884(Av)		30.08	54	-23.92
	7326(Pk)		47.42	74	-26.58
	7326(Av)		34.60	54	-19.40
2462	2462(Pk)	Vertical	105.40	*	-
	2462(Av)		92.90	*	-
	2483.5(Pk)		60.58	74	-13.42
	2483.5(Av)		45.49	54	-8.51
	4924(Pk)		42.58	74	-31.42
	4924(Av)		29.92	54	-24.08
	7386(Pk)		50.85	74	-23.15
	7386(Av)		36.21	54	-17.79
	2462(Pk)	Horizontal	104.85	*	-
	2462(Av)		92.23	*	-
	2483.5(Pk)		60.86	74	-13.14
	2483.5(Av)		45.37	54	-8.63
	4924(Pk)		42.13	74	-31.87
	4924(Av)		30.27	54	-23.73
	7386(Pk)		56.61	74	-17.39
	7386(Av)		36.26	54	-17.74

802.11n: MCS0

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	70.07	74	-3.93
	2390(Av)		51.37	54	-2.63
	2412(Pk)		106.78	*	-
	2412(Av)		96.76	*	-
	4824(Pk)		42.87	74	-31.13
	4824(Av)		29.56	54	-24.44
	7236(Pk)		47.00	74	-27.00
	7236(Av)		34.08	54	-19.92
	2390(Pk)	Horizontal	68.21	74	-5.79
	2390(Av)		50.62	54	-3.38
	2412(Pk)		106.58	*	-
	2412(Av)		96.82	*	-
	4824(Pk)		42.21	74	-31.79
	4824(Av)		29.65	54	-24.35
	7236(Pk)		48.31	74	-25.69
	7236(Av)		35.15	54	-18.85
2442	2442(Pk)	Vertical	107.34	*	-
	2442(Av)		97.61	*	-
	4884(Pk)		42.21	74	-31.79
	4884(Av)		29.65	54	-24.35
	7326(Pk)		48.31	74	-25.69
	7326(Av)		35.15	54	-18.85
	2442(Pk)	Horizontal	106.42	*	-
	2442(Av)		96.82	*	-
	4884(Pk)		44.45	74	-29.55
	4884(Av)		30.83	54	-23.17
	7326(Pk)		47.82	74	-26.18
	7326(Av)		34.82	54	-19.18
2462	2462(Pk)	Vertical	101.96	*	-
	2462(Av)		91.59	*	-
	2483.5(Pk)		62.12	74	-11.88
	2483.5(Av)		44.05	54	-9.96
	4924(Pk)		42.85	74	-31.15
	4924(Av)		29.90	54	-24.10
	7386(Pk)		49.90	74	-24.10
	7386(Av)		35.62	54	-18.38
	2462(Pk)	Horizontal	104.65	*	-
	2462(Av)		95.23	*	-
	2483.5(Pk)		67.96	74	-6.04
	2483.5(Av)		49.34	54	-4.66
	4924(Pk)		44.40	74	-29.60
	4924(Av)		31.32	54	-22.68
	7386(Pk)		52.83	74	-21.17
	7386(Av)		37.37	54	-16.63

802.11n: MCS4

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	66.74	74	-7.26
	2390(Av)		49.11	54	-4.89
	2412(Pk)		107.55	*	-
	2412(Av)		95.35	*	-
	4824(Pk)		41.76	74	-32.24
	4824(Av)		29.22	54	-24.78
	7236(Pk)		46.87	74	-27.13
	7236(Av)		34.03	54	-19.97
	2390(Pk)	Horizontal	68.68	74	-5.32
	2390(Av)		48.70	54	-5.30
	2412(Pk)		107.73	*	-
	2412(Av)		95.57	*	-
	4824(Pk)		41.77	74	-32.23
	4824(Av)		28.88	54	-25.12
	7236(Pk)		47.62	74	-26.38
	7236(Av)		34.02	54	-19.98
2442	2442(Pk)	Vertical	106.55	*	-
	2442(Av)		94.23	*	-
	4884(Pk)		42.37	74	-31.63
	4884(Av)		29.46	54	-24.54
	7326(Pk)		47.88	74	-26.12
	7326(Av)		34.82	54	-19.18
	2442(Pk)	Horizontal	107.25	*	-
	2442(Av)		95.03	*	-
	4884(Pk)		43.43	74	-30.57
	4884(Av)		29.77	54	-24.23
	7326(Pk)		48.75	74	-25.25
	7326(Av)		34.68	54	-19.32
2462	2462(Pk)	Vertical	106.26	*	-
	2462(Av)		93.78	*	-
	2483.5(Pk)		65.18	74	-8.82
	2483.5(Av)		48.59	54	-5.41
	4924(Pk)		43.57	74	-30.43
	4924(Av)		30.35	54	-23.65
	7386(Pk)		50.93	74	-23.07
	7386(Av)		35.50	54	-18.50
	2462(Pk)	Horizontal	104.90	*	-
	2462(Av)		92.58	*	-
	2483.5(Pk)		63.91	74	-10.09
	2483.5(Av)		46.08	54	-7.92
	4924(Pk)		44.59	74	-29.41
	4924(Av)		30.26	54	-23.74
	7386(Pk)		50.38	74	-23.62
	7386(Av)		35.98	54	-18.02

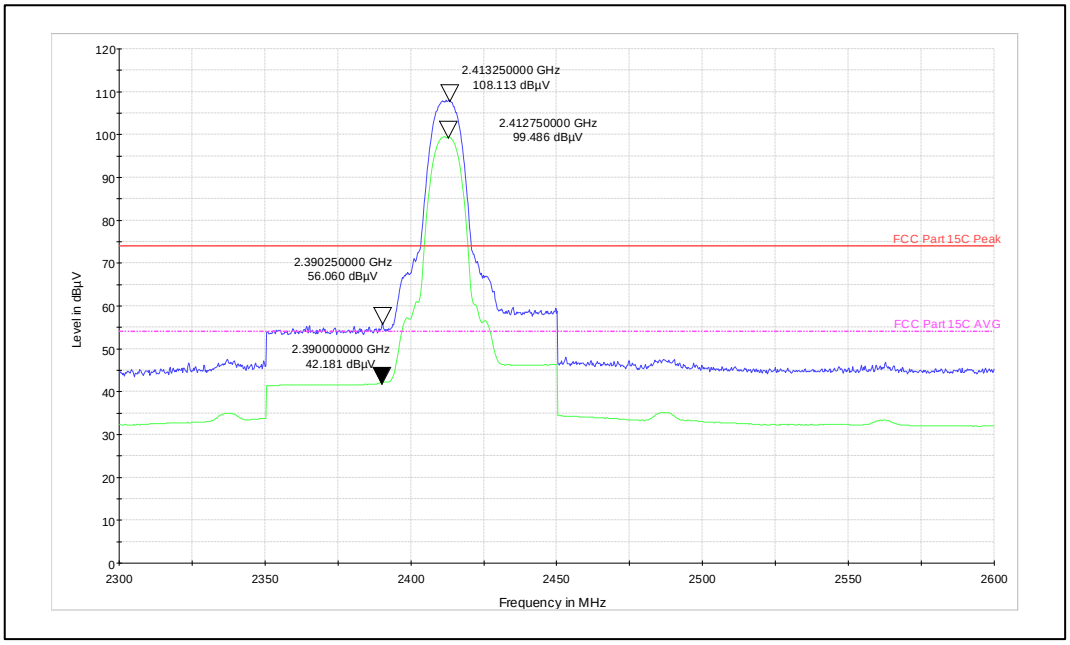
802.11n: MCS7

Channel Frequency (MHz)	Measured Frequency (MHz)	Antenna Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	2390(Pk)	Vertical	68.76	74	-5.24
	2390(Av)		49.86	54	-4.14
	2412(Pk)		106.79	*	-
	2412(Av)		93.08	*	-
	4824(Pk)		42.14	74	-31.86
	4824(Av)		29.08	54	-24.92
	7236(Pk)		48.14	74	-25.86
	7236(Av)		34.06	54	-19.94
	2390(Pk)	Horizontal	64.77	74	-9.23
	2390(Av)		48.26	54	-5.74
	2412(Pk)		105.31	*	-
	2412(Av)		91.38	*	-
	4824(Pk)		41.83	74	-32.17
	4824(Av)		28.78	54	-25.22
	7236(Pk)		47.05	74	-26.95
	7236(Av)		34.05	54	-19.95
2442	2442(Pk)	Vertical	107.52	*	-
	2442(Av)		93.98	*	-
	4884(Pk)		42.40	74	-31.60
	4884(Av)		29.24	54	-24.76
	7326(Pk)		47.46	74	-26.54
	7326(Av)		34.69	54	-19.31
	2442(Pk)	Horizontal	106.34	*	-
	2442(Av)		92.39	*	-
	4884(Pk)		44.33	74	-29.67
	4884(Av)		30.08	54	-23.92
	7326(Pk)		47.03	74	-26.97
	7326(Av)		34.50	54	-19.50
2462	2462(Pk)	Vertical	105.90	*	-
	2462(Av)		91.99	*	-
	2483.5(Pk)		64.29	74	-9.71
	2483.5(Av)		47.88	54	-6.12
	4924(Pk)		44.37	74	-29.63
	4924(Av)		30.25	54	-23.75
	7386(Pk)		51.86	74	-22.14
	7386(Av)		36.20	54	-17.80
	2462(Pk)	Horizontal	104.85	*	-
	2462(Av)		91.05	*	-
	2483.5(Pk)		62.31	74	-11.69
	2483.5(Av)		44.86	54	-9.14
	4924(Pk)		43.84	74	-30.16
	4924(Av)		30.12	54	-23.88
	7386(Pk)		50.12	74	-23.88
	7386(Av)		35.39	54	-18.61

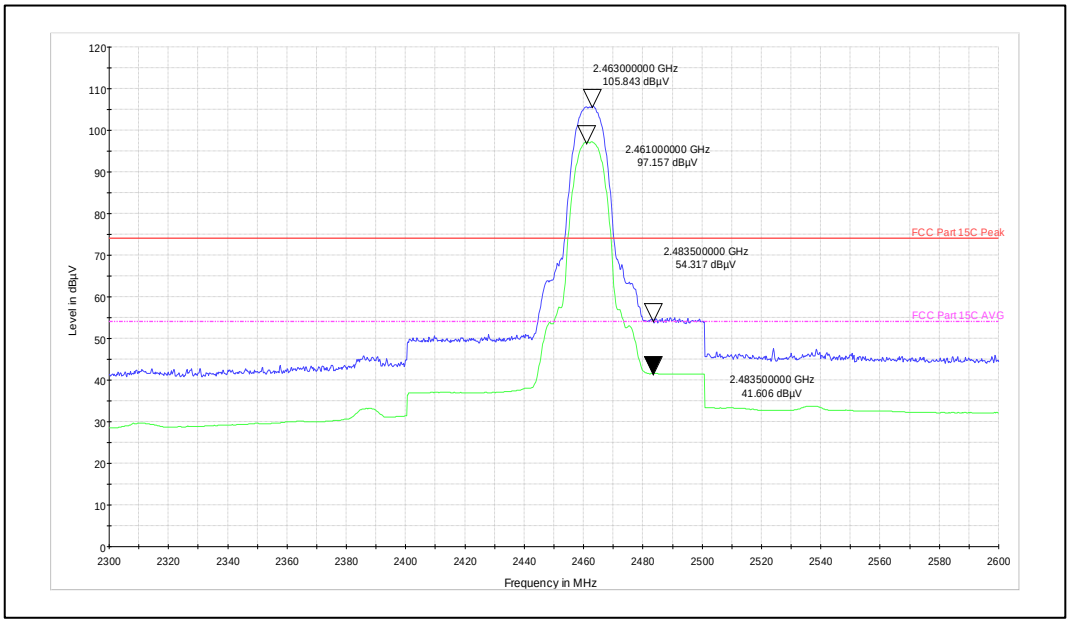
***- : Fundamental Frequency**
Pk: Peak Detector; Av: Average Detector

Worst Case Plots for Restricted bands and spurious emissions:

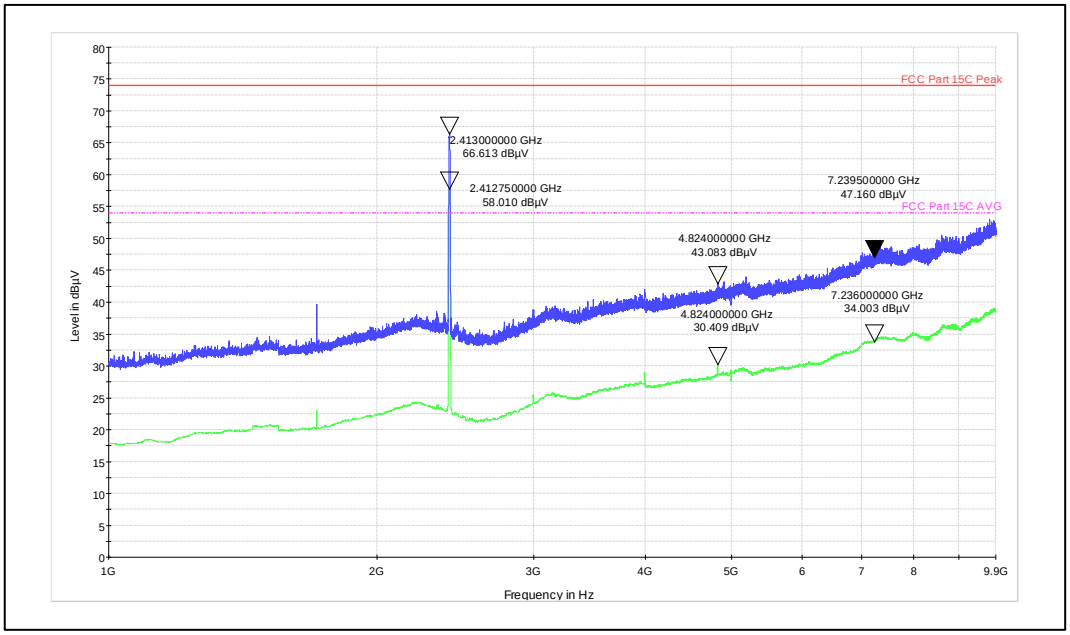
802.11b: 11Mbps



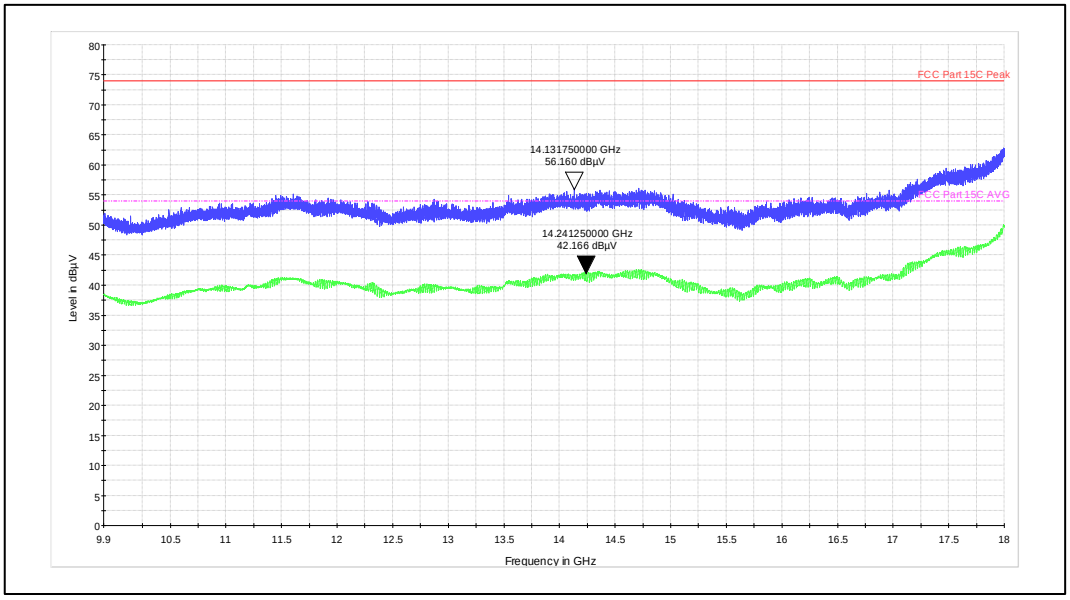
Channel Frequency: 2412MHz Polarization: Vertical



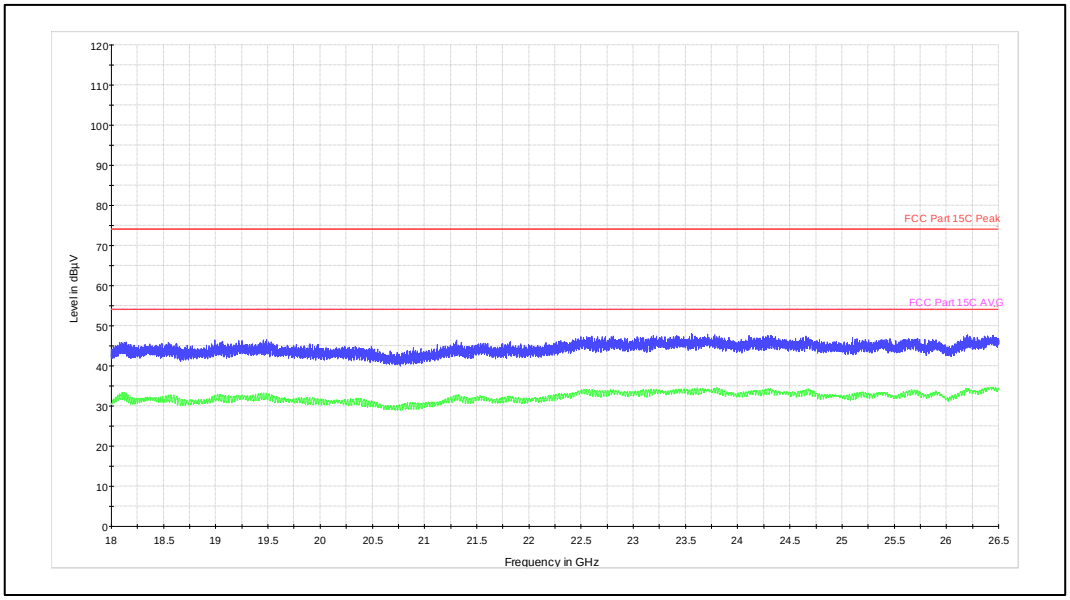
Channel Frequency: 2462MHz Polarization: Vertical



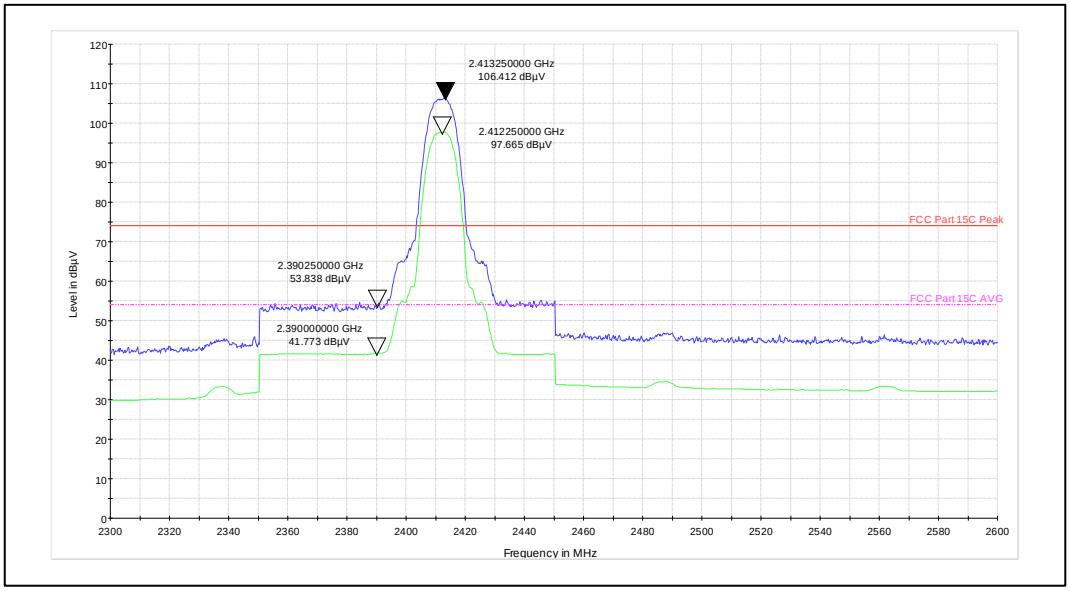
Frequency Range: 1-9.9GHz Polarization: Vertical



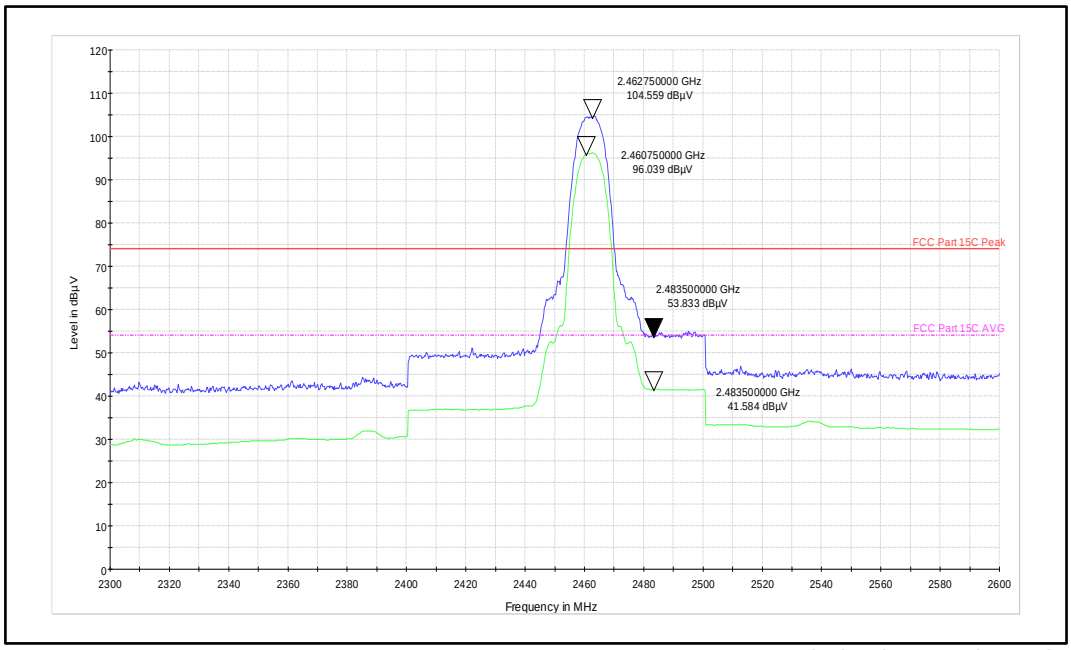
Frequency Range: 9.9-18GHz Polarization: Vertical



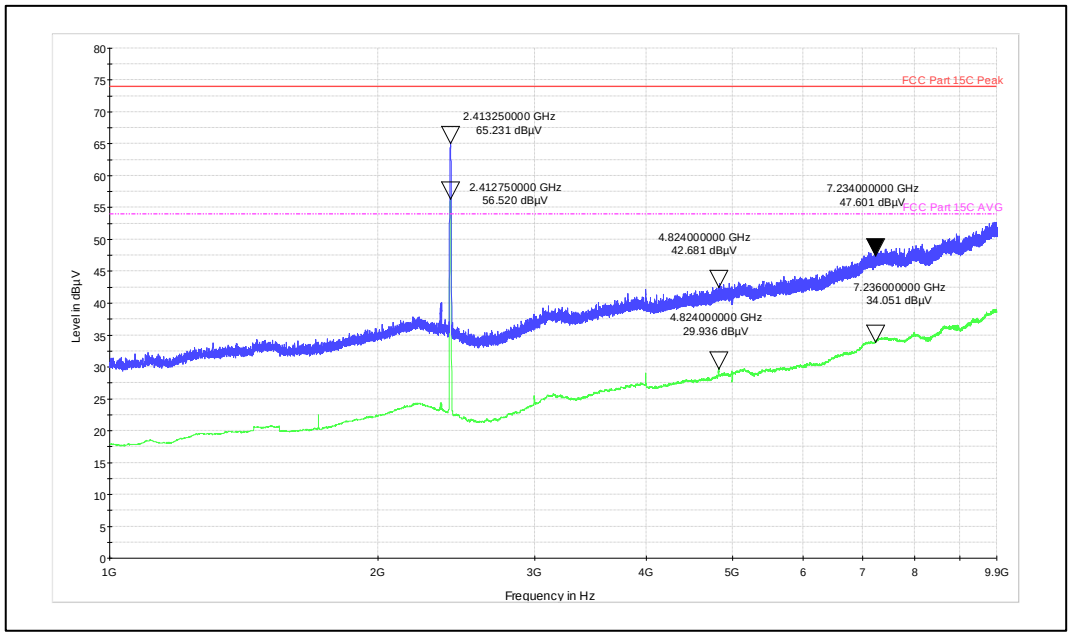
Frequency Range: 18-26.5GHz Polarization: Vertical



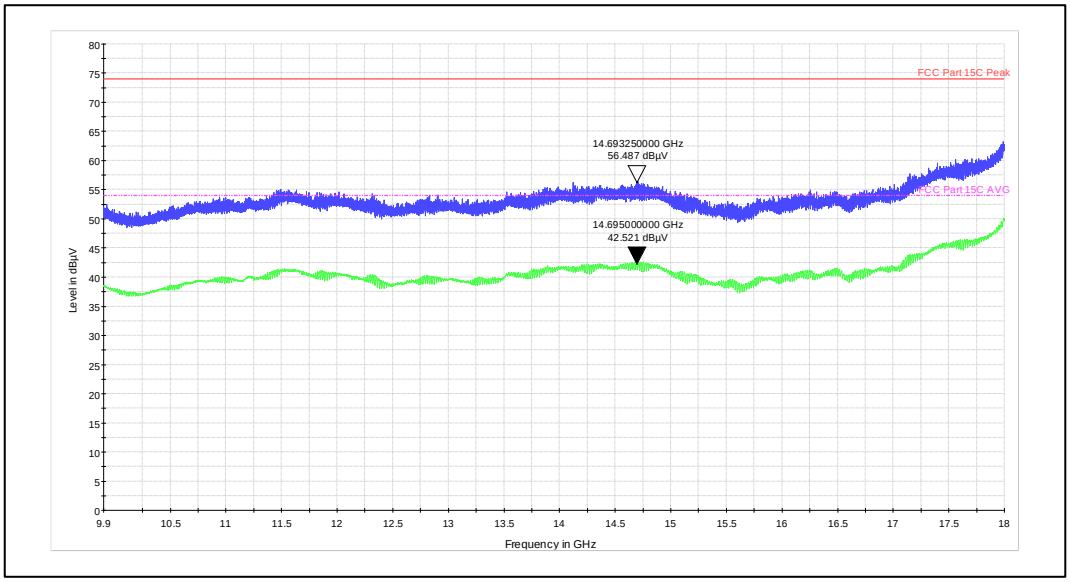
Frequency Range: 2412MHz Polarization: Horizontal



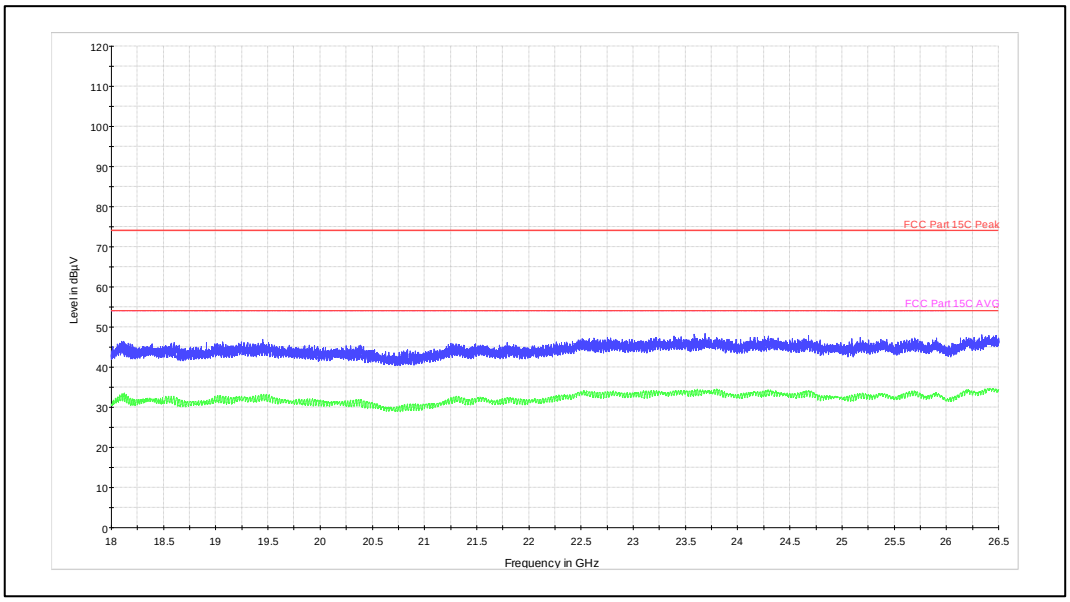
Frequency Range: 2462MHz Polarization: Horizontal



Frequency Range: 1-9.9GHz Polarization: Horizontal

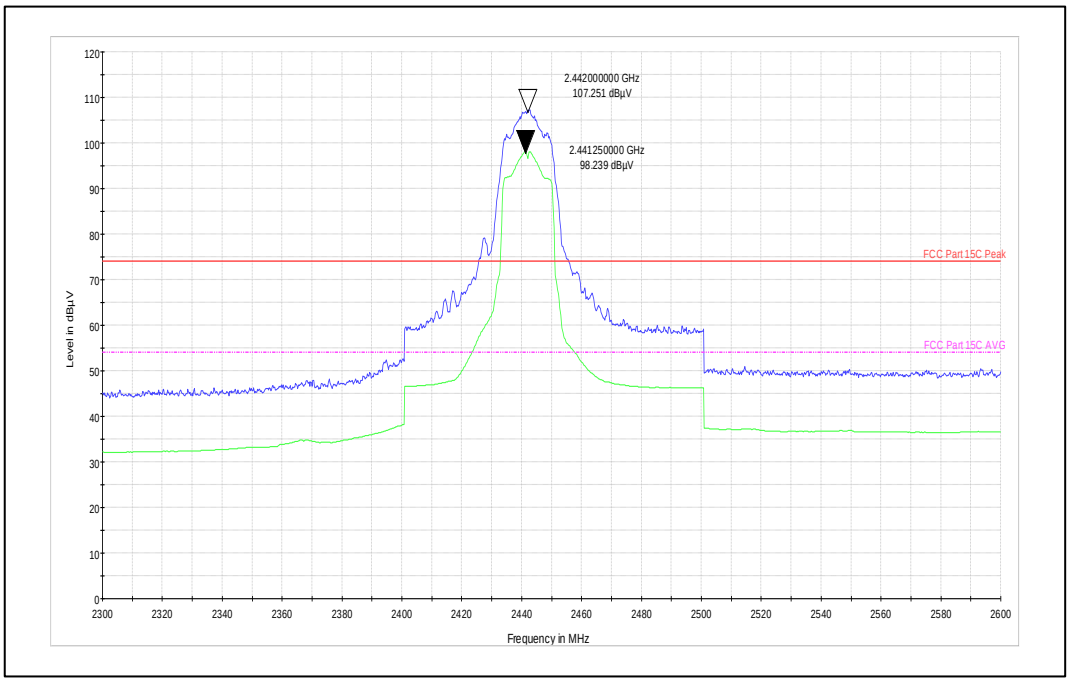


Frequency Range: 9.9-18GHz Polarization: Horizontal

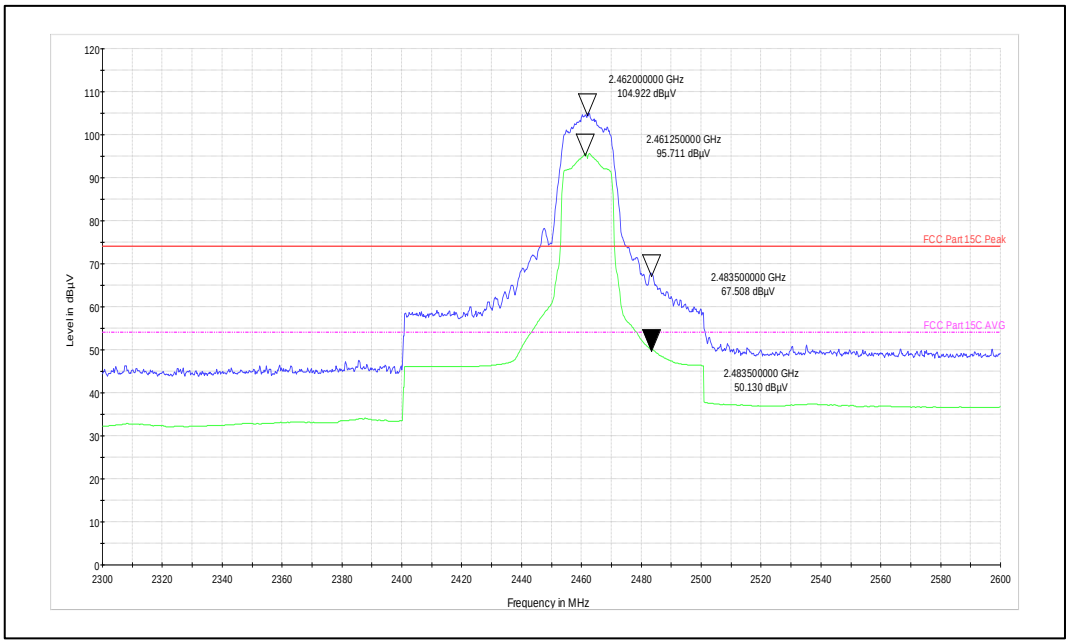


Frequency Range: 18-26.5GHz Polarization: Horizontal

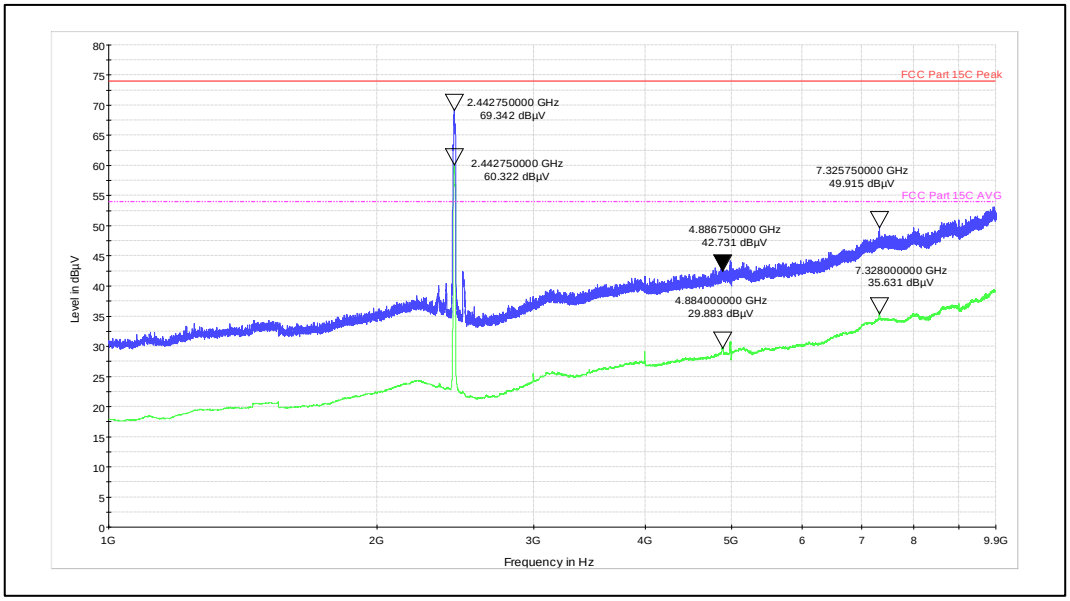
802.11g: 6Mbps



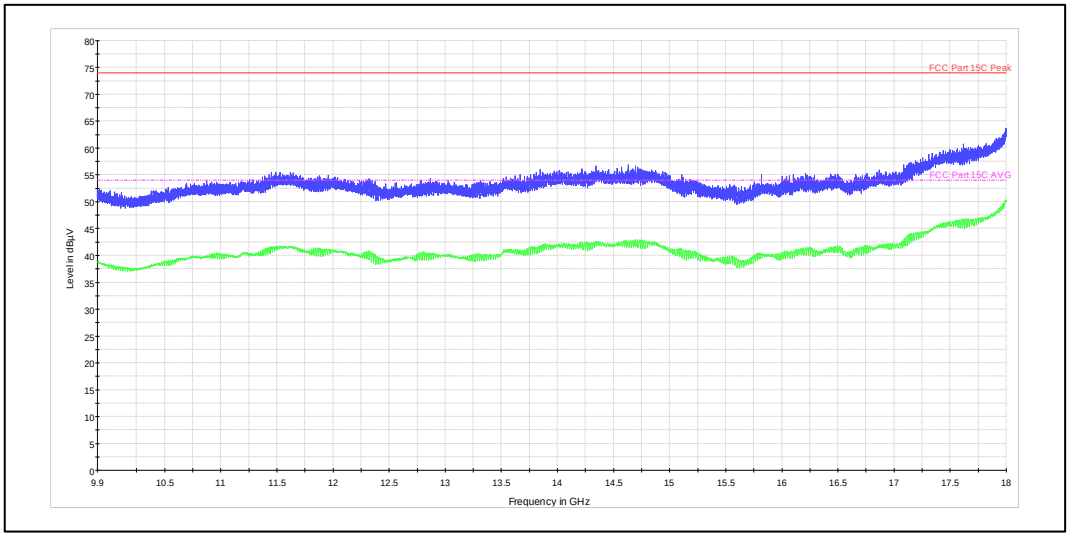
Channel Frequency: 2442MHz Polarization: Vertical



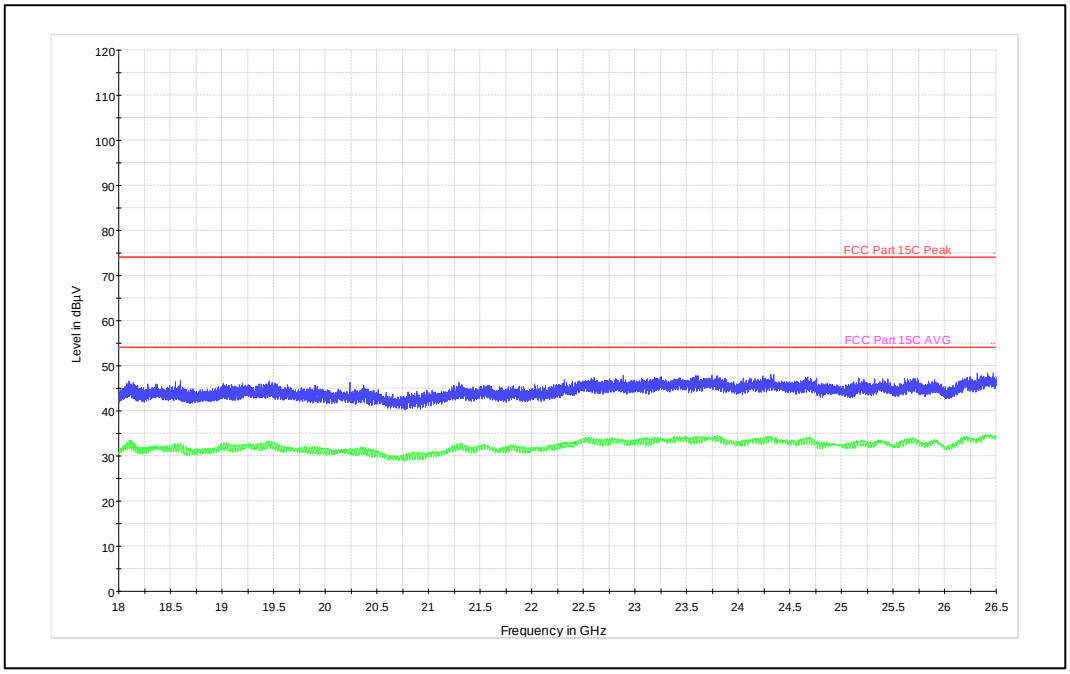
Channel Frequency: 2462MHz Polarization: Vertical



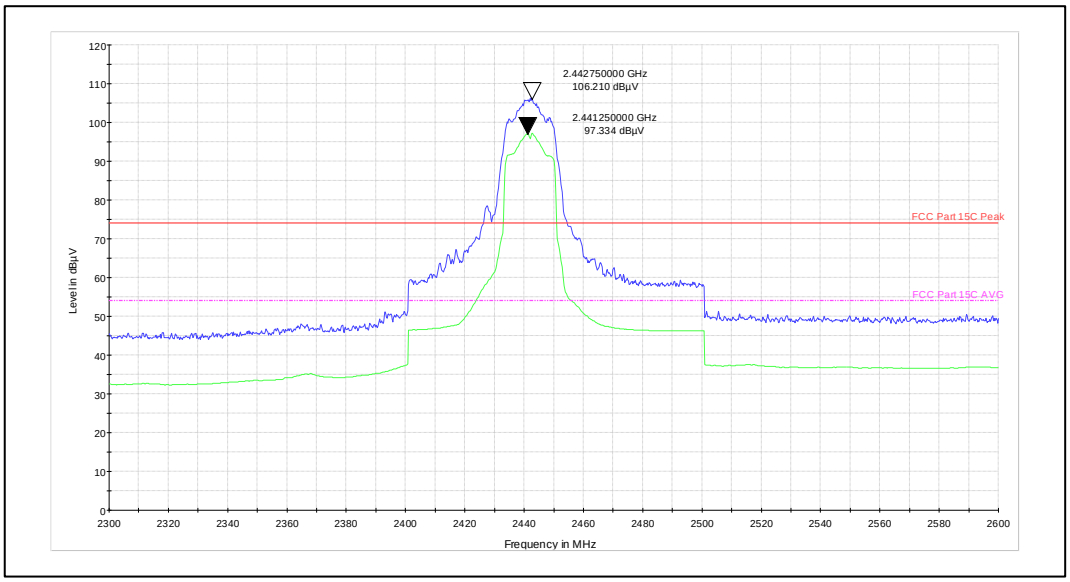
Frequency Range: 1-9.9GHz Polarization: Vertical



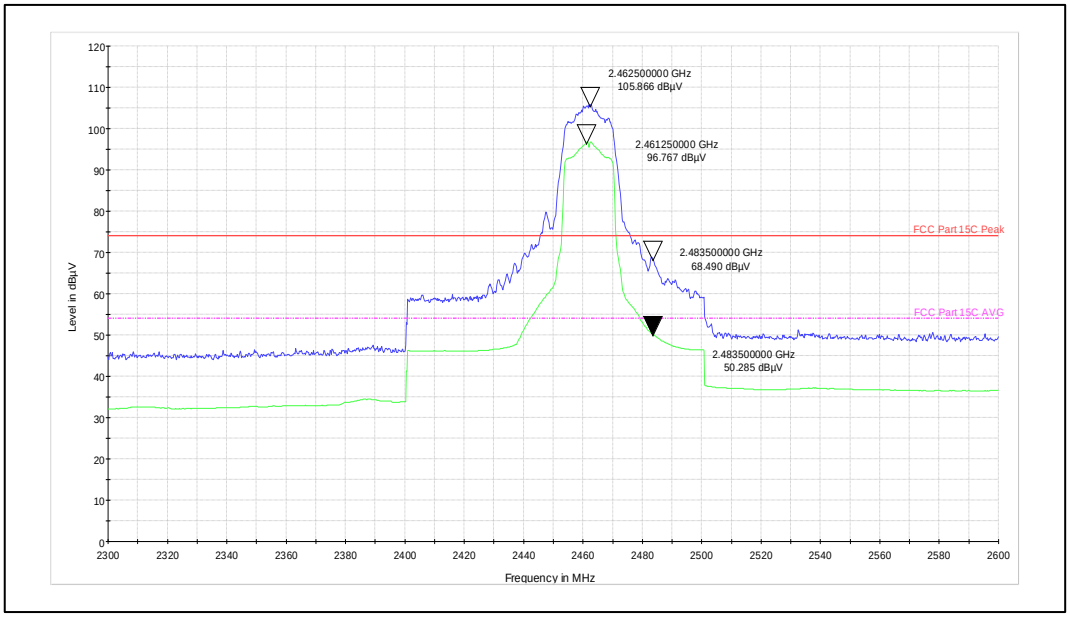
Frequency Range: 9.9-18GHz Polarization: Vertical



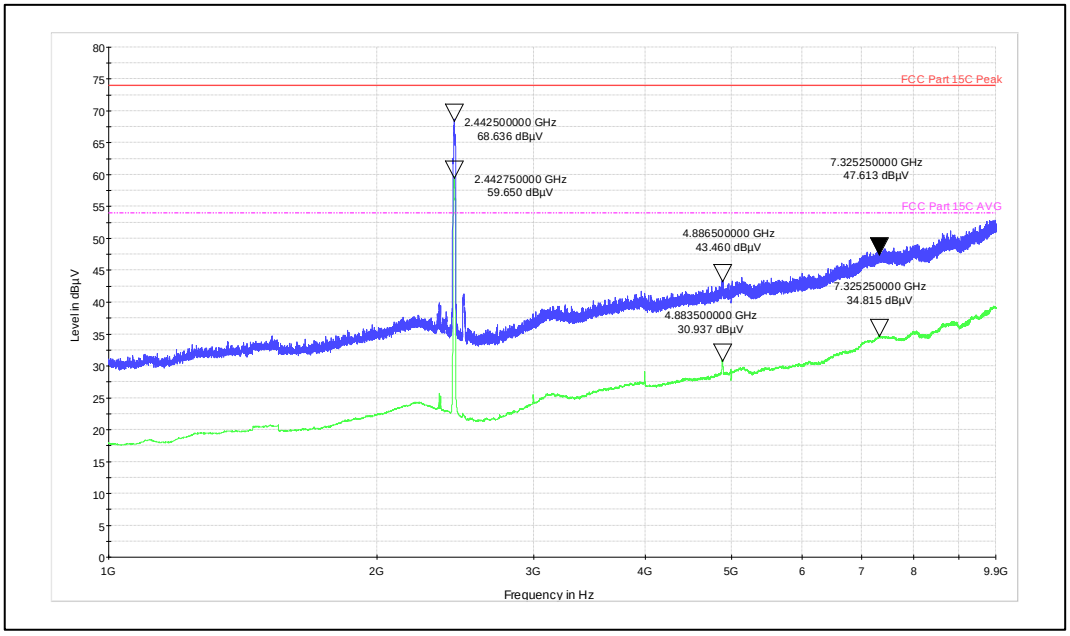
Frequency Range: 18-26.5GHz Polarization: Vertical



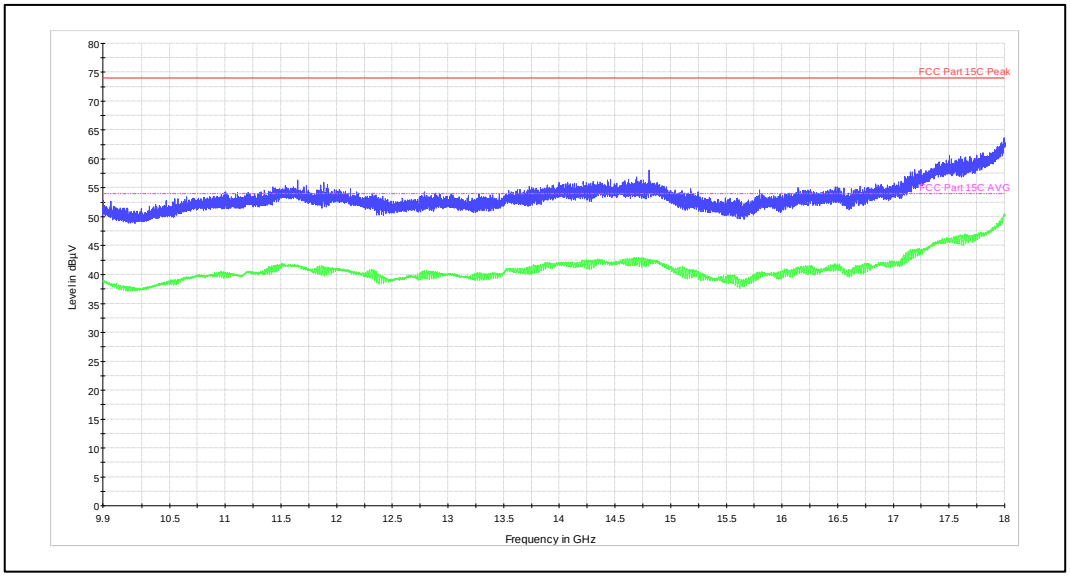
Channel Frequency: 2442MHz Polarization: Horizontal



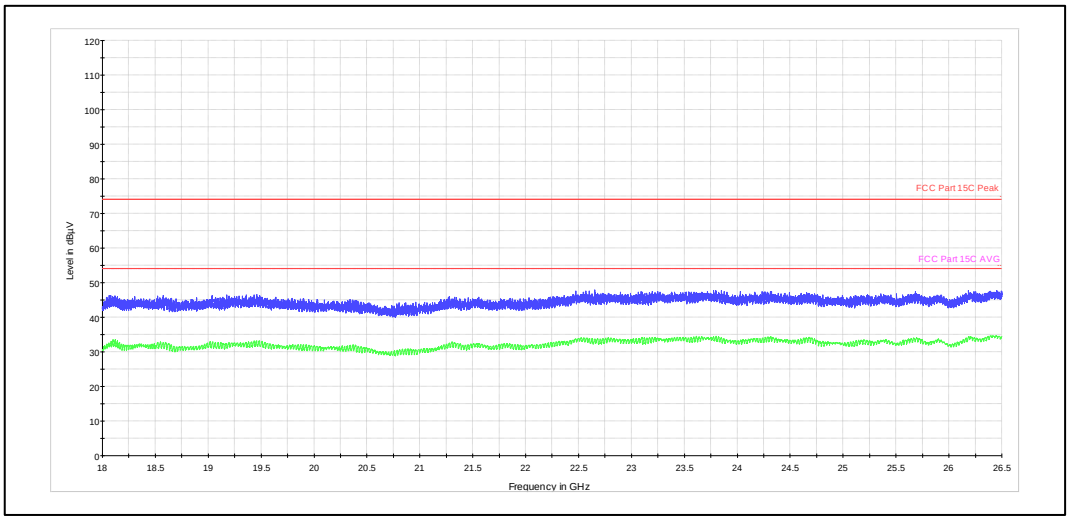
Channel Frequency: 2462MHz Polarization: Horizontal



Frequency Range: 1-9.9GHz Polarization: Horizontal

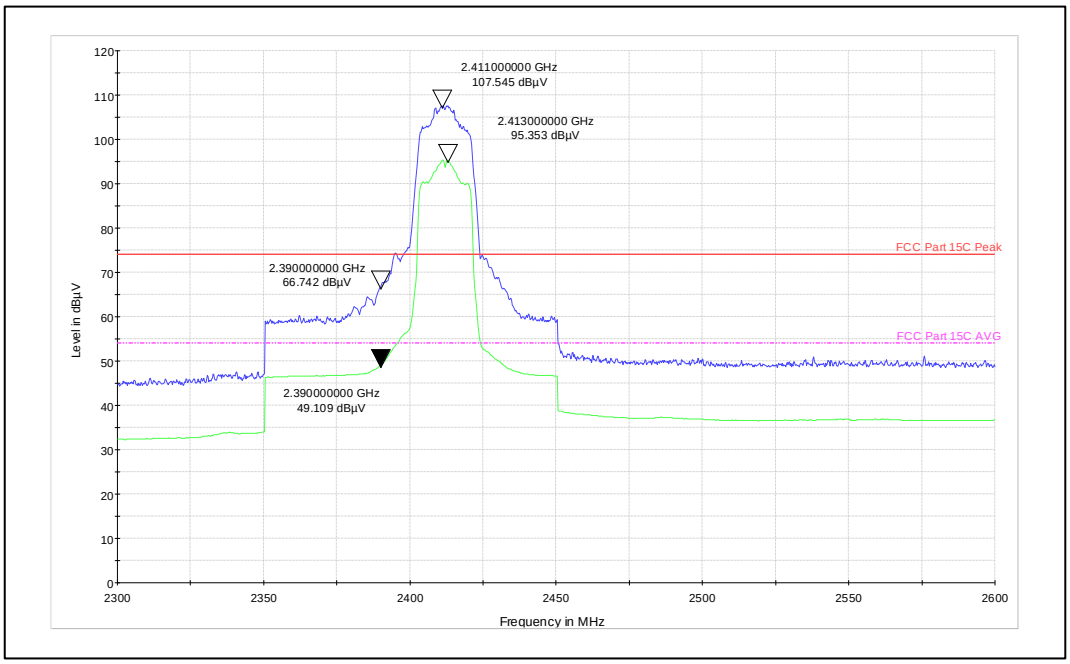


Frequency Range: 9.9-18GHz Polarization: Horizontal

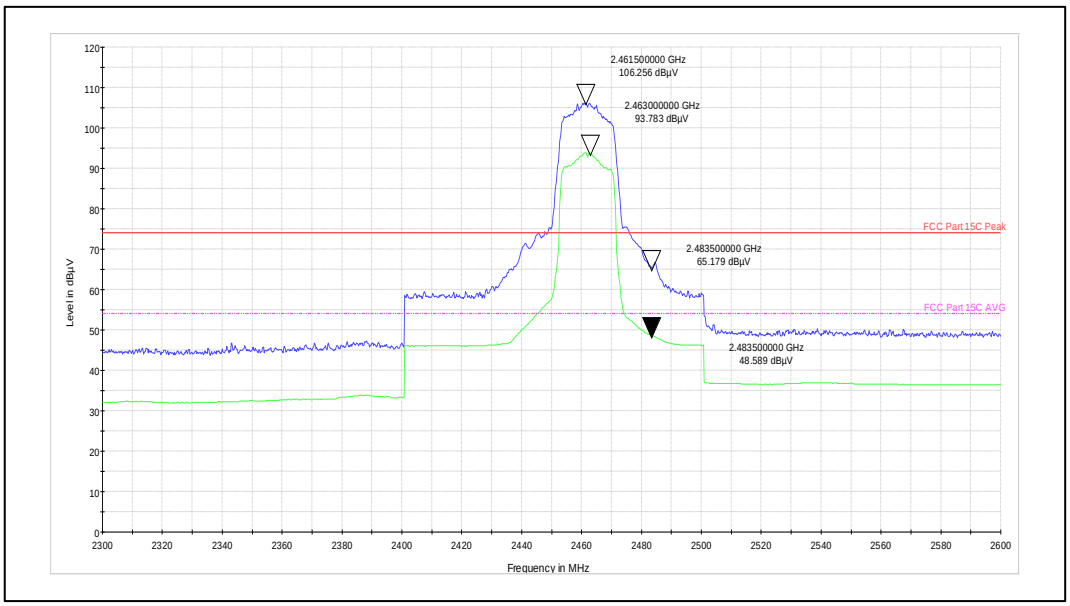


Frequency Range: 18-26.5GHz Polarization: Horizontal

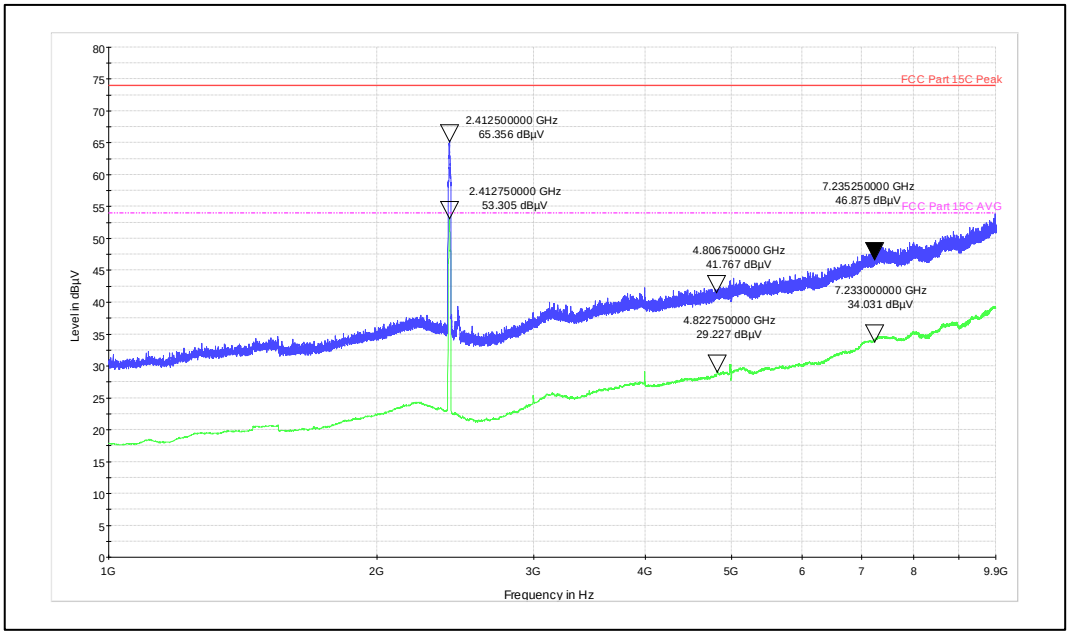
802.11n: MCS4



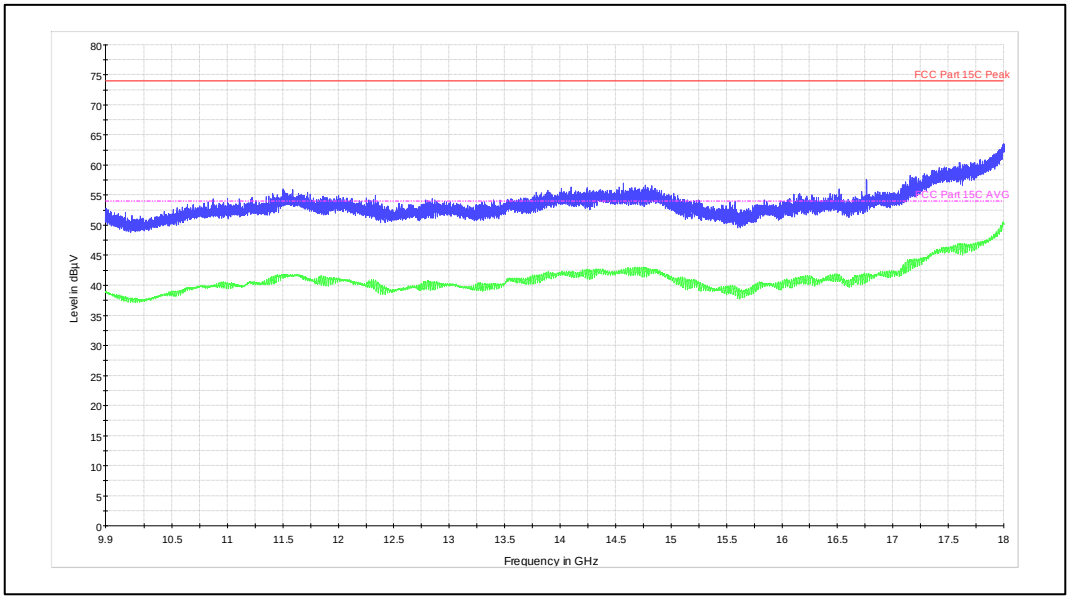
Channel Frequency: 2412MHz Polarization: Vertical



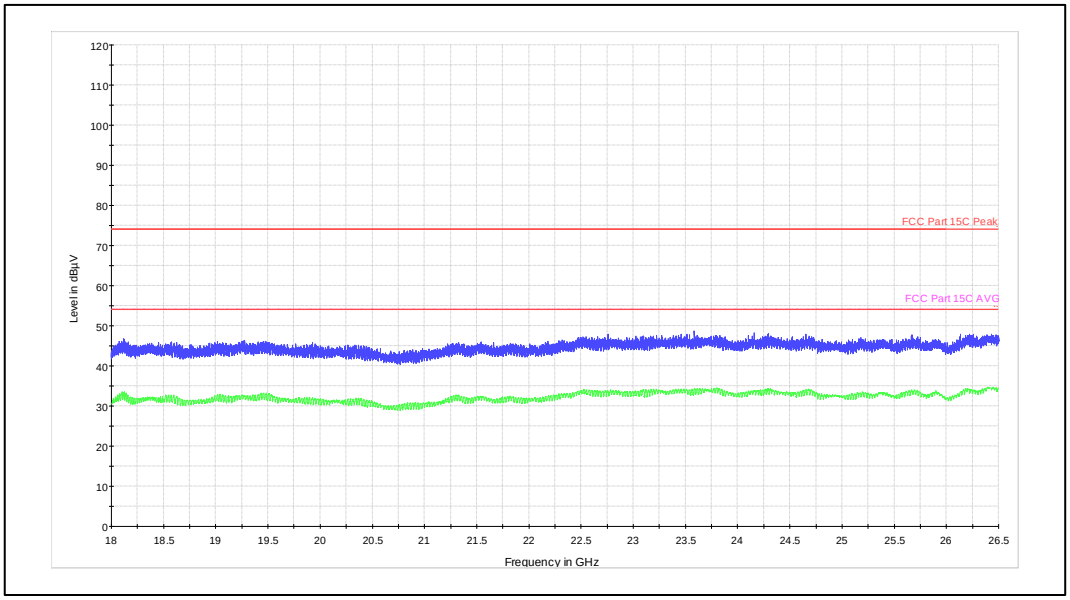
Channel Frequency: 2462MHz Polarization: Vertical



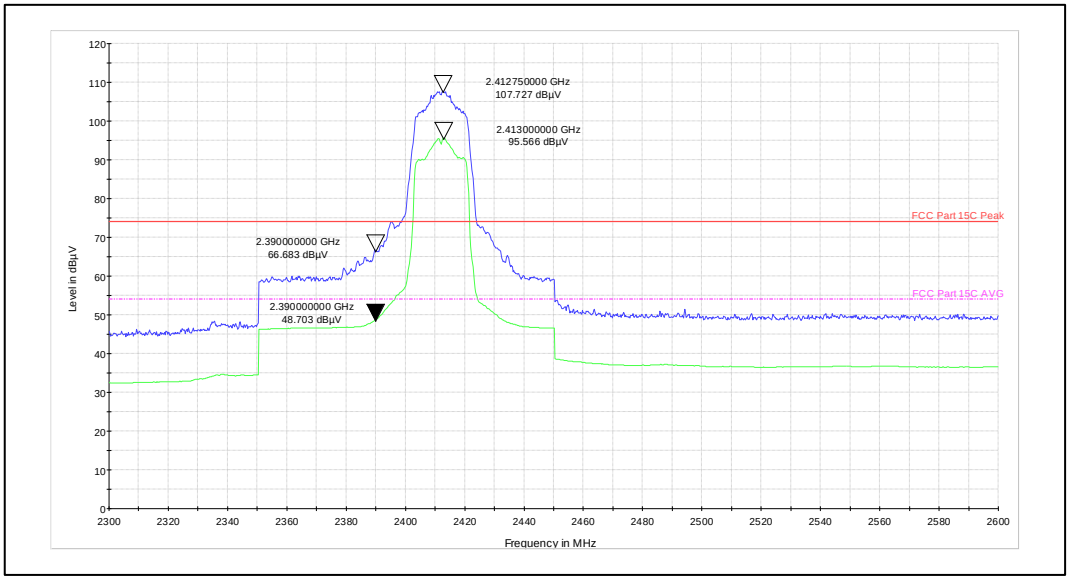
Frequency Range: 1-9.9GHz Polarization: Vertical



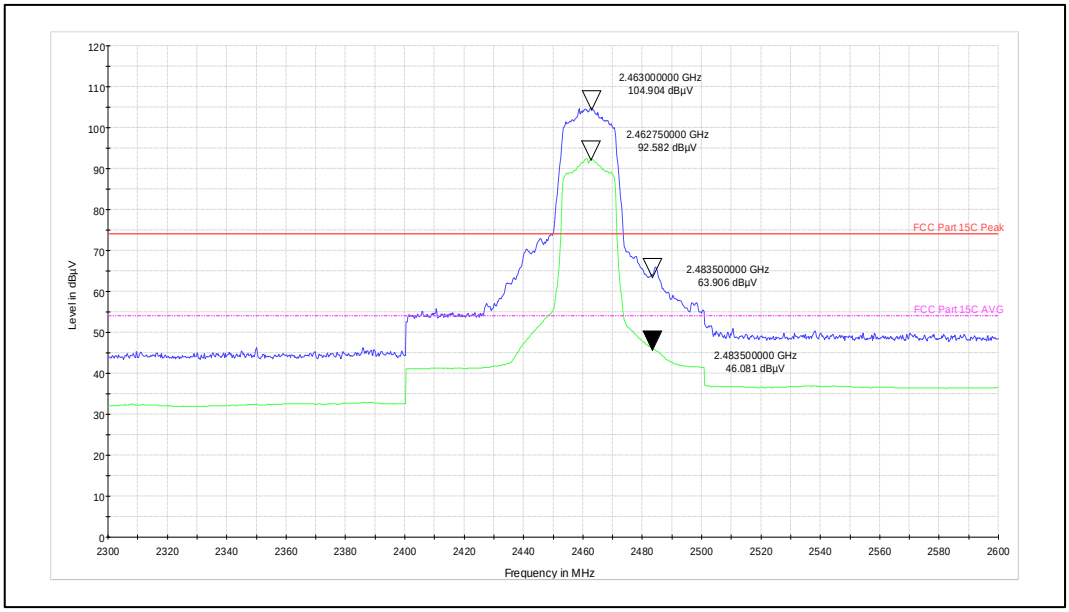
Frequency Range: 9.9-18GHz Polarization: Vertical



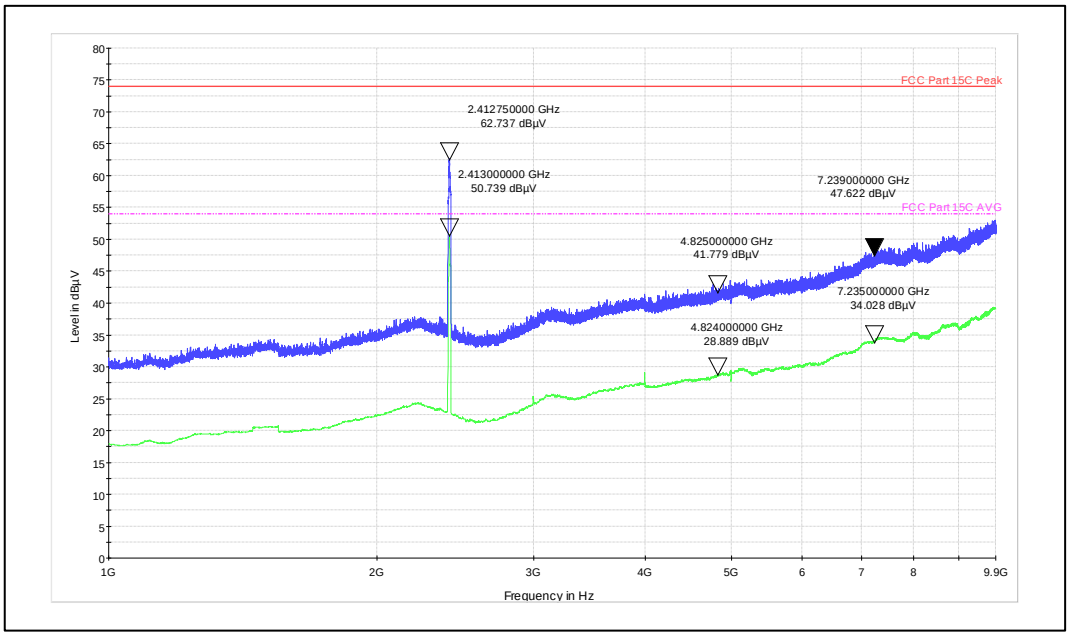
Frequency Range: 18-26.5GHz Polarization: Vertical



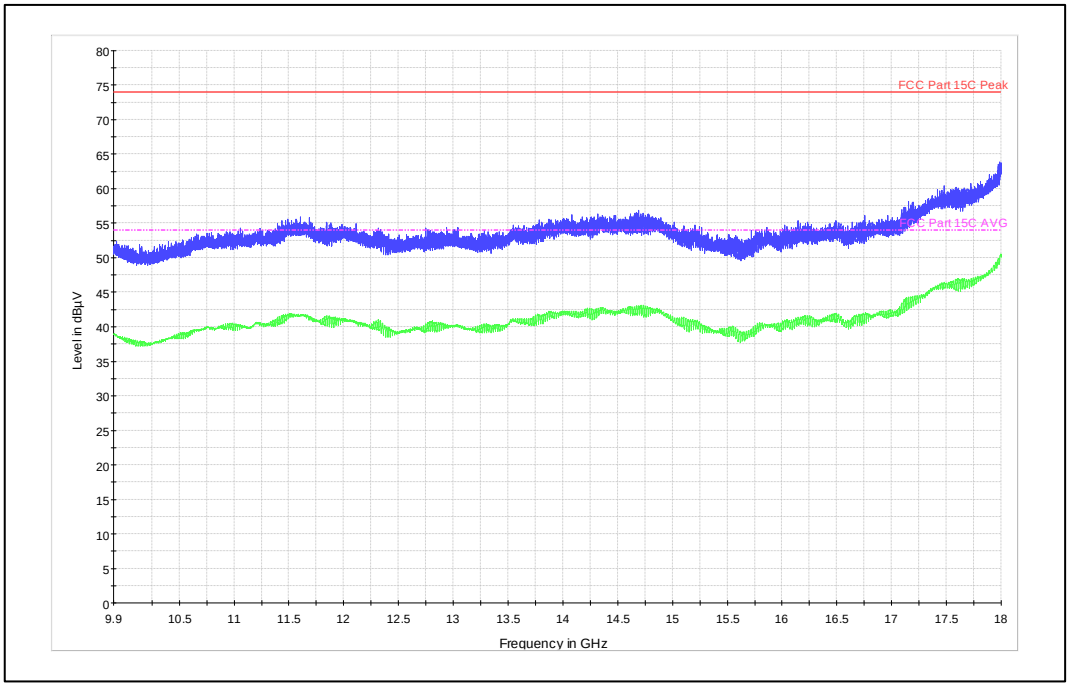
Channel Frequency: 2412MHz Polarization: Horizontal



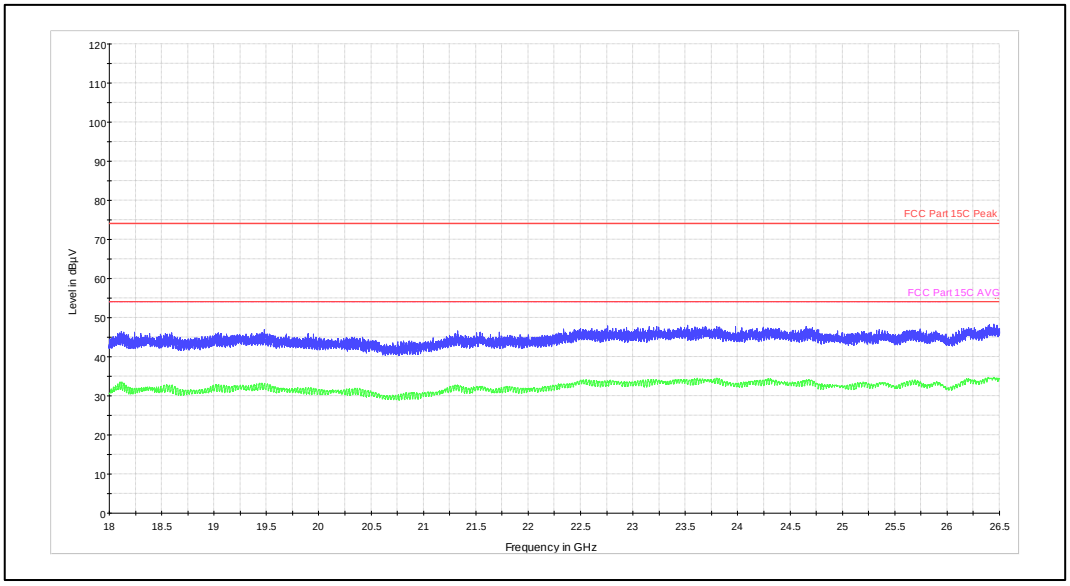
Channel Frequency: 2462MHz Polarization: Horizontal



Frequency Range: 1-9.9GHz Polarization: Horizontal



Frequency Range: 9.9-18GHz Polarization: Horizontal



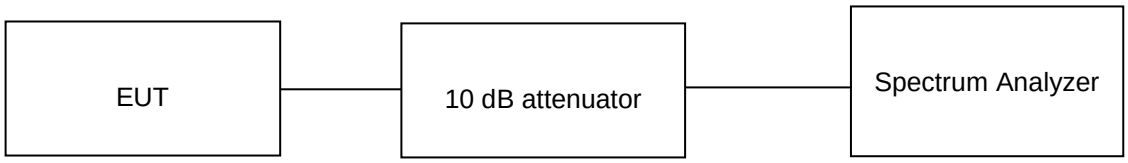
Frequency Range: 18-26.5GHz Polarization: Horizontal

7 TEST RESULTS: BLUETOOTH LOW ENERGY (BLE)

7.1 Maximum Peak Conducted Output Power

Result ***Pass***

Test Specification	FCC Part 15 Subpart C 15.247 (b) (3)
Measurement Bandwidth	1 MHz
Detector	Peak
Requirement	≤ 1 W (30 dBm)



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

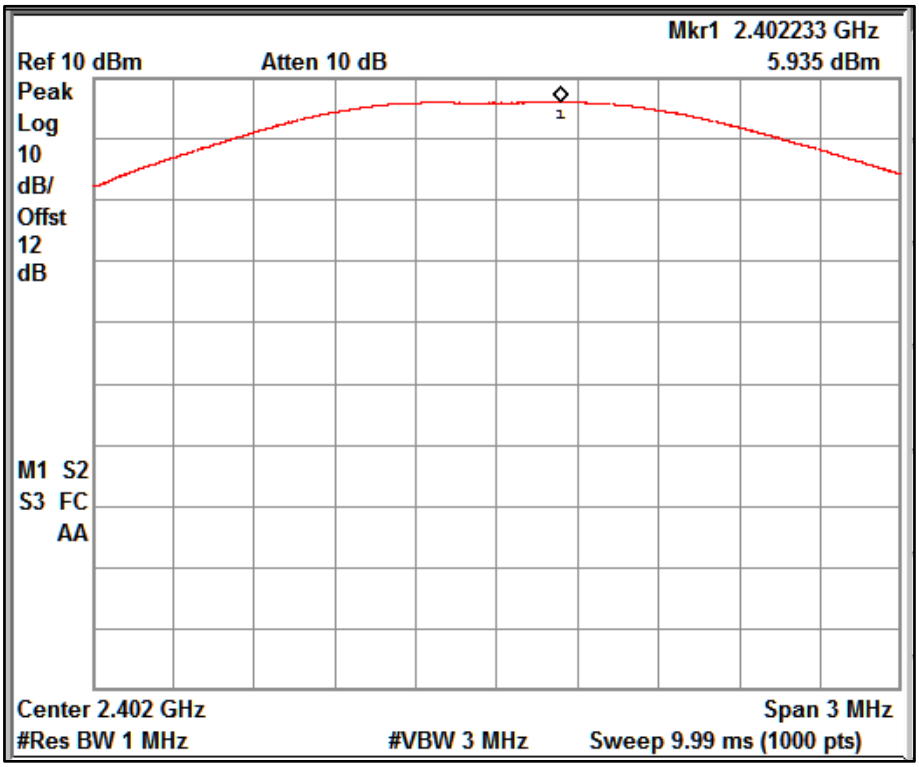
Test results:

Note: Measurements were made as per section 8.3.1.3 in 558074 D01 15.247 Measurement Guidance v05r02.

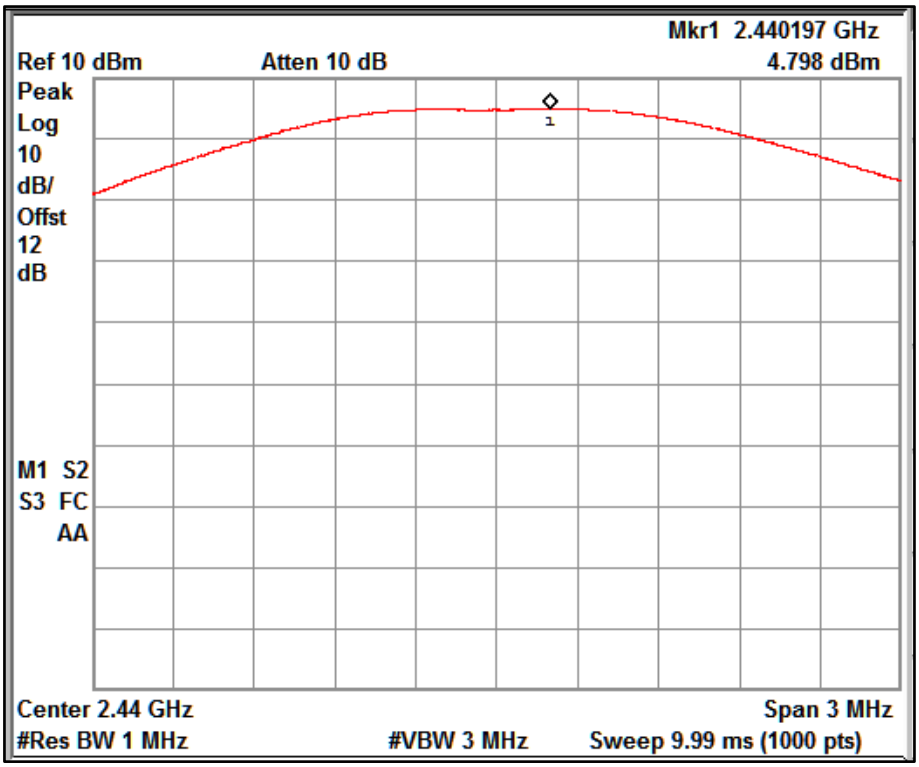
10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below results

Table 15: Maximum peak conducted output power verified Test Results

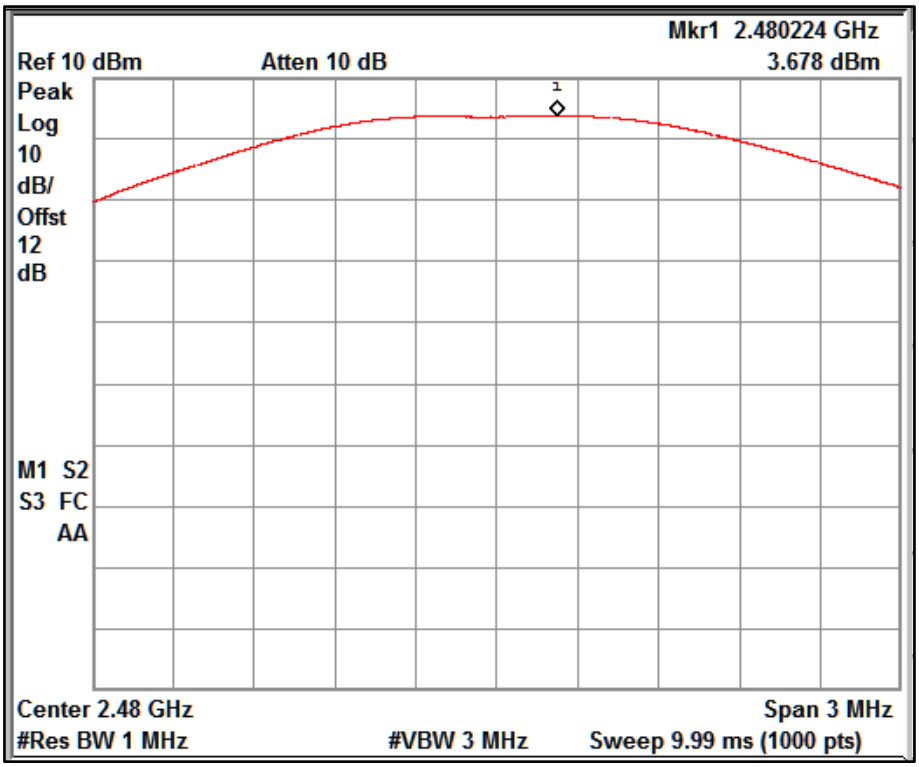
Data Rate (Mbps)	Channel Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)	Limit (dBm)
1	2402	5.935	30
	2444	4.798	30
	2480	3.678	30



Data rate: 1Mbps Channel Frequency: 2402MHz



Data rate: 1Mbps Channel Frequency: 2440MHz

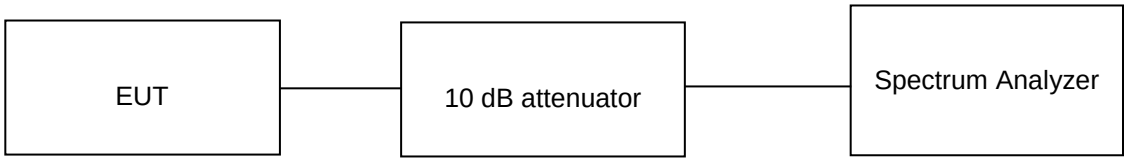


Data rate: 1Mbps Channel Frequency: 2480MHz

7.2 Maximum Power Spectral Density

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (e)
Detector Function	Peak
Port of testing	Antenna port
Requirement	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm.



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

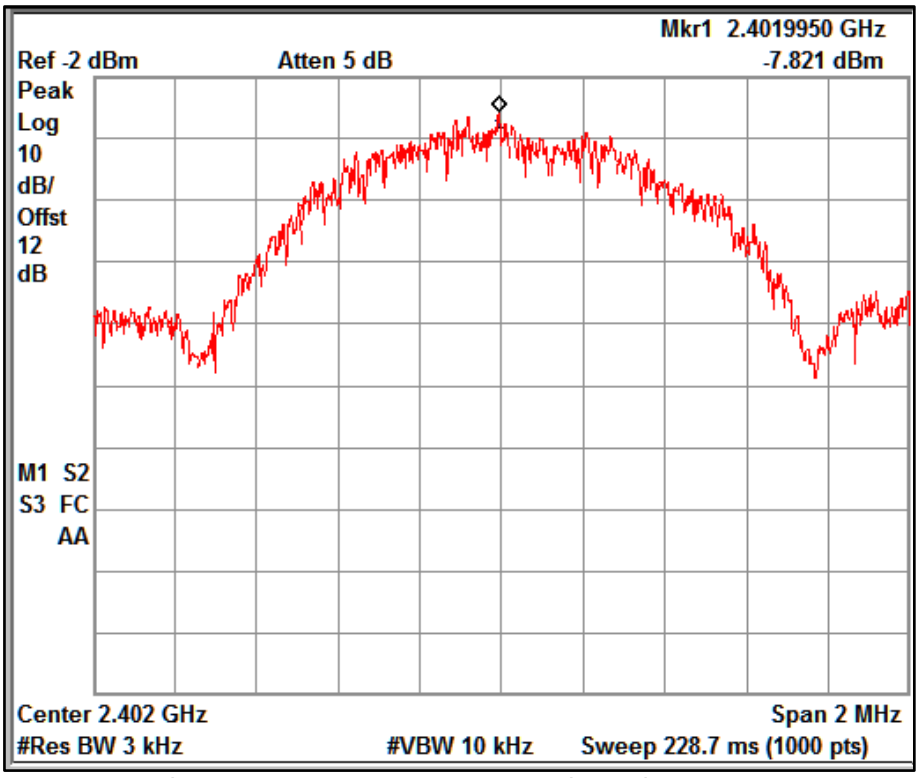
Test results:

Note: Measurements were made as per section 8.4 in 558074 D01 15.247 Measurement Guidance v05r02.

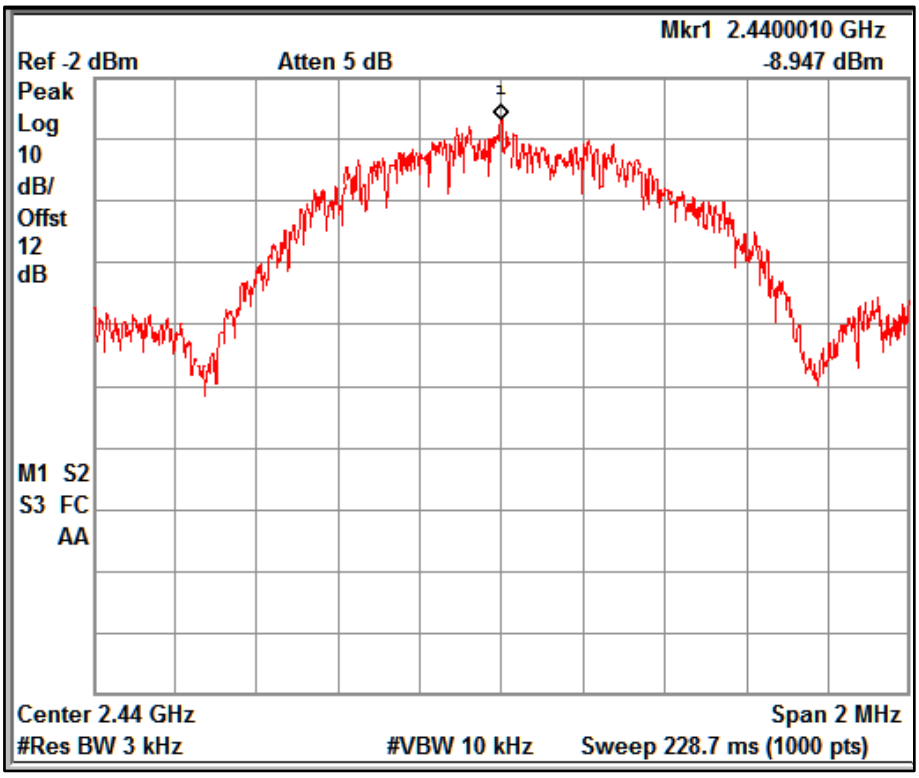
10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below results

Table 16: Maximum power spectral density verified Test Results

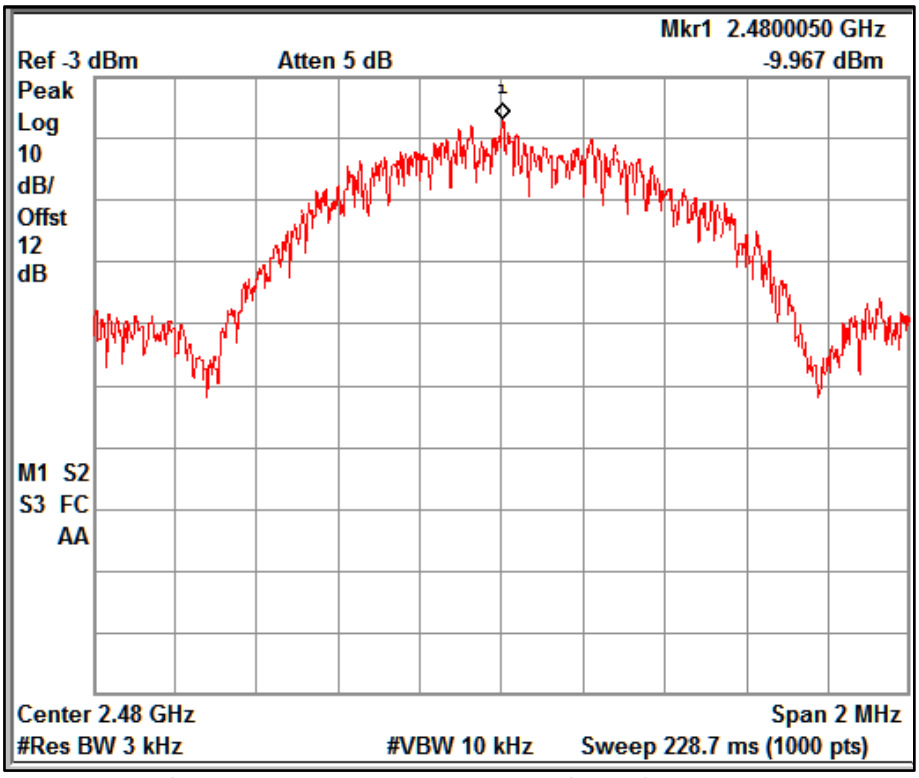
Data Rate (Mbps)	Channel Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
1	2402	-7.821	8
	2444	-8.947	8
	2480	-9.967	8



Data rate: 1Mbps Channel Frequency: 2402MHz



Data rate: 1Mbps Channel Frequency: 2440MHz

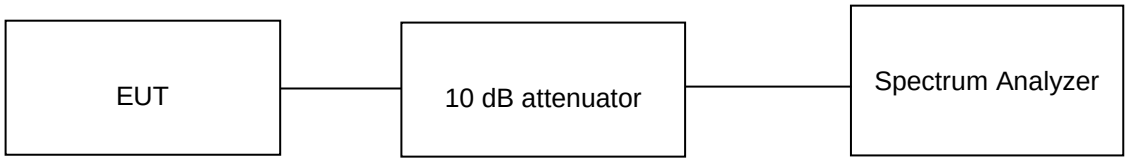


Data rate: 1Mbps Channel Frequency: 2480MHz

7.3 DTS Bandwidth

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (a)(2)
Detector	Peak
Port of testing	Antenna Port
Requirement	The minimum 6 dB bandwidth shall be at least 500 kHz.



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

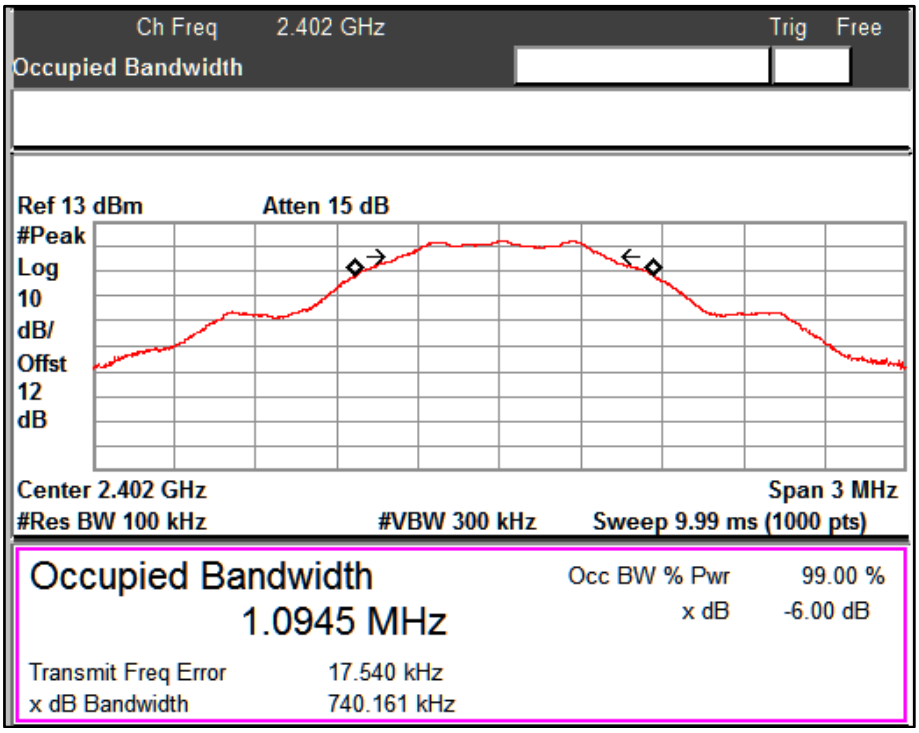
Test results:

Note: Measurements were made as per section 8.2 in 558074 D01 15.247 Measurement Guidance v05r02.

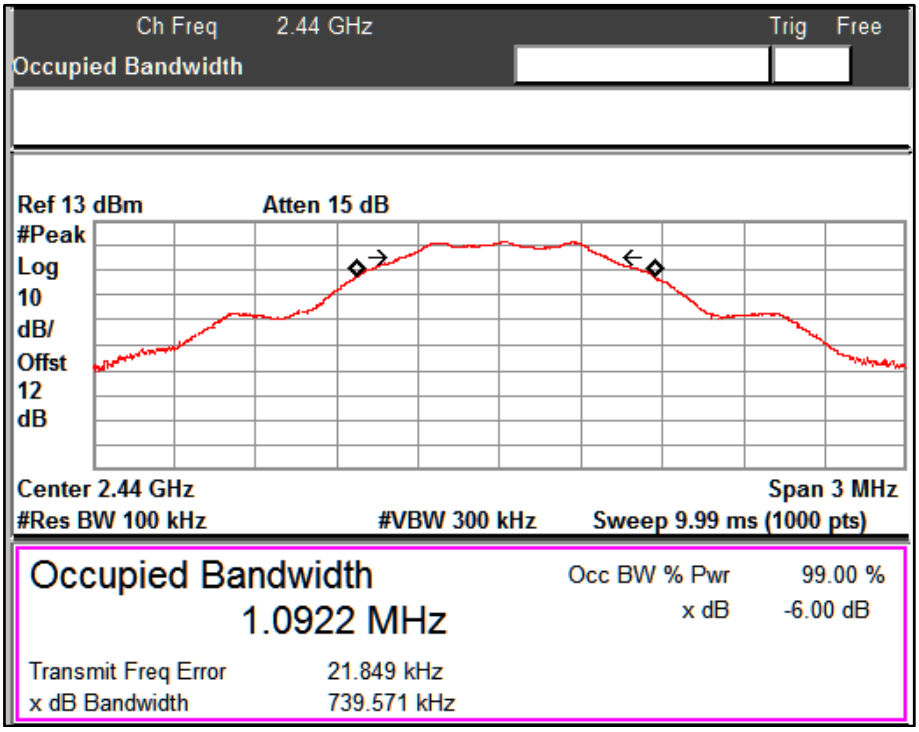
10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below result.

Table 17: DTS Bandwidth verified Test Results

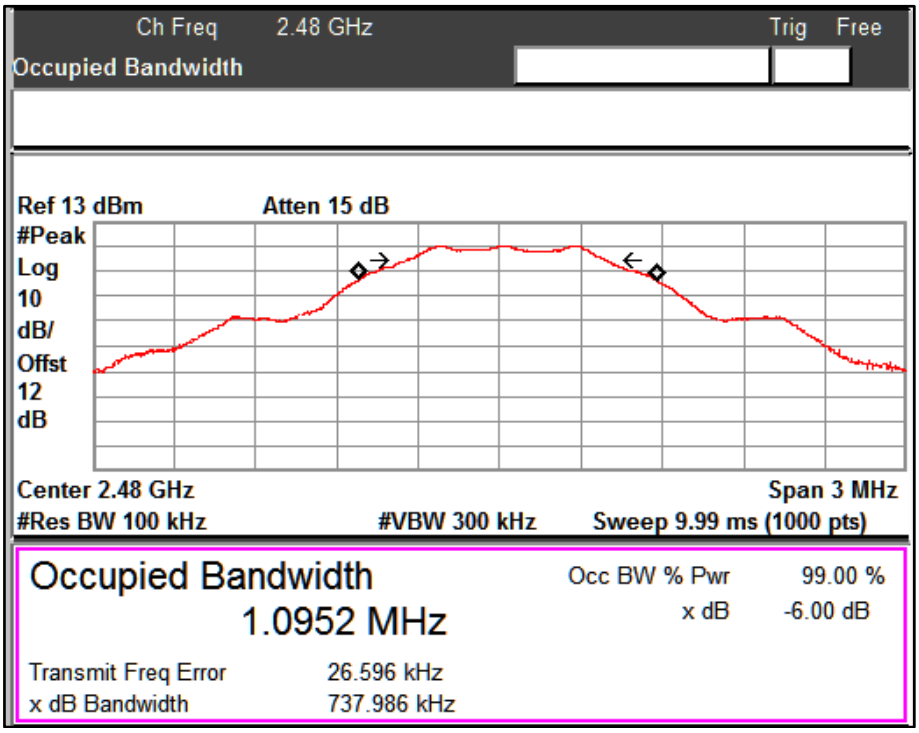
Data Rate (Mbps)	Channel Frequency (MHz)	6dB Bandwidth (MHz)	99% OBW (MHz)
1	2402	740.161	1.094
	2444	739.571	1.092
	2480	737.986	1.095



Data rate: 1Mbps Channel Frequency: 2402MHz



Data rate: 1Mbps Channel Frequency: 2440MHz



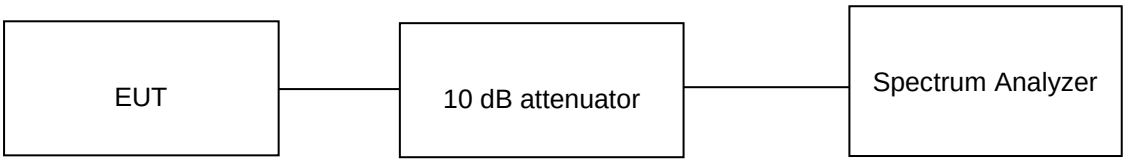
Data rate: 1Mbps Channel Frequency: 2480MHz

7.4 Emissions in non-restricted frequency bands and Conducted Spurious Emission

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247 (d)
Detector Function	Peak
Port of testing	Antenna port
Requirement	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:



Environmental conditions:

Temperature: +23.5 °C RH: 61.7 %

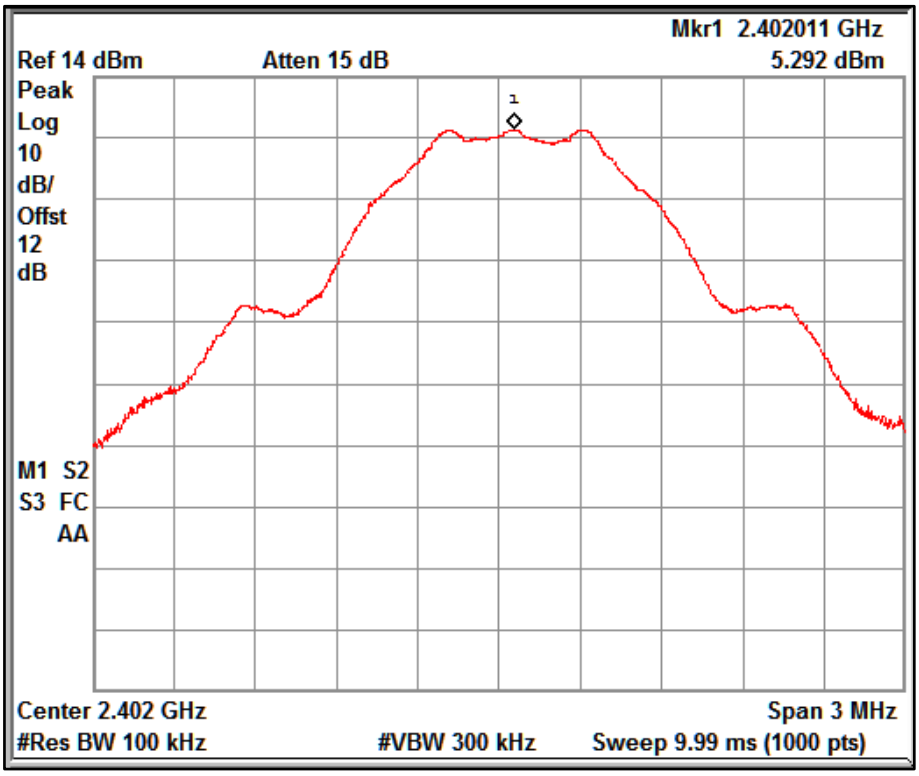
Test results:

Note: Measurements were made as per section 8.5 in 558074 D01 15.247 Measurement Guidance v05r02.

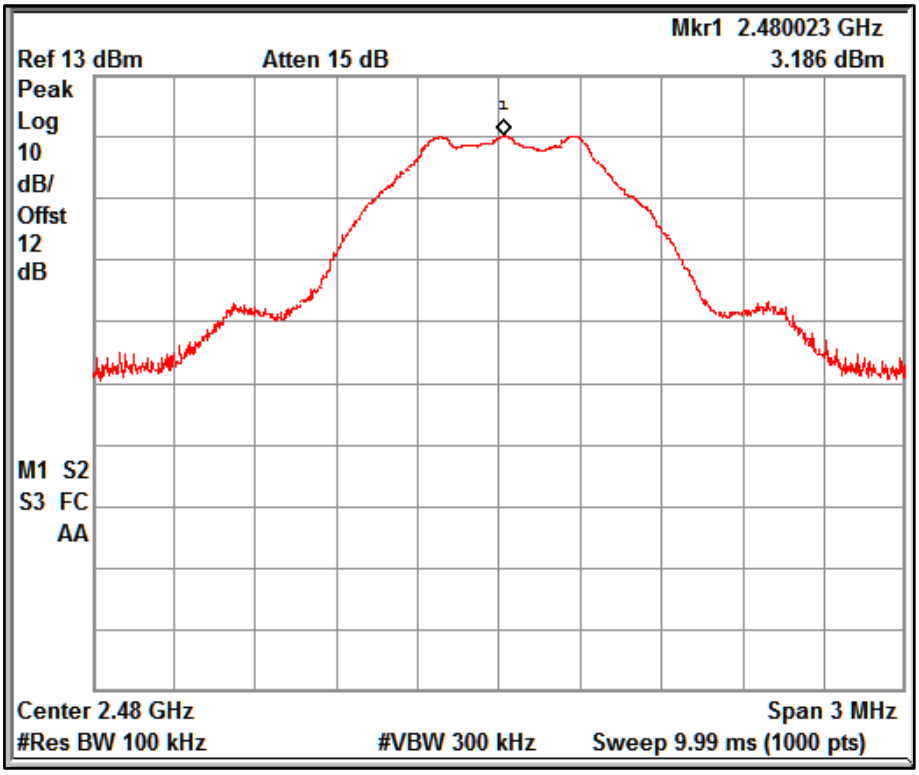
10 dB attenuator + 2 dB Cable loss = 12 dB offset is considered in below result

Table 18: Verified Test Results of Emissions in non-restricted frequency bands

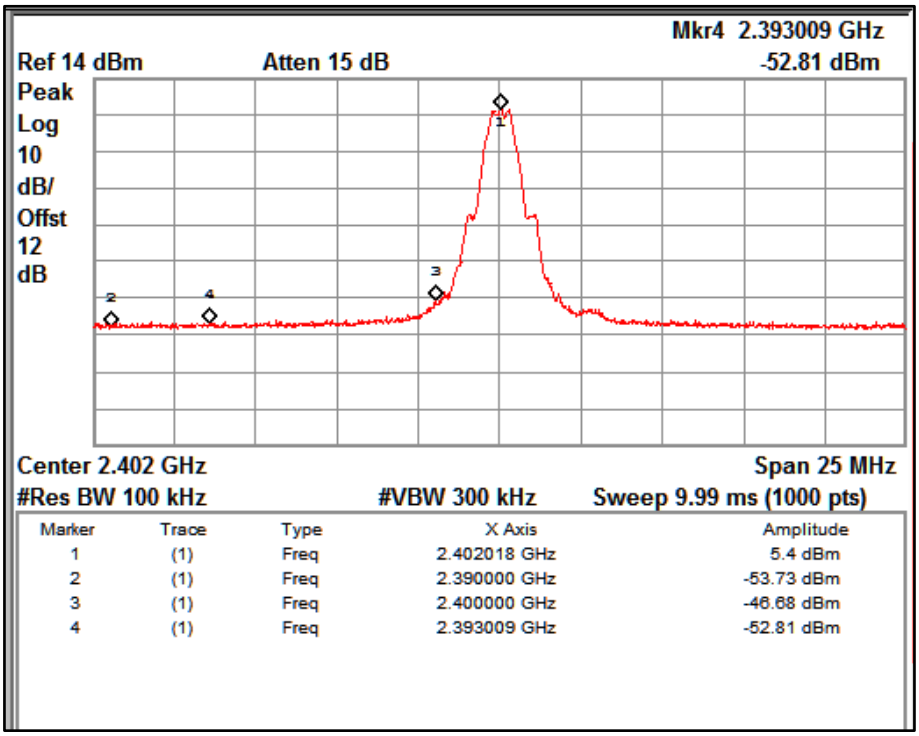
Data Rate (Mbps)	Channel Frequency (MHz)	Value at the Band Edge		Reference Value B (dBm)	Band Edge Value A~B (dBc)	Limit (dBc)
		Frequency (MHz)	Value A (dBm)			
1	2402	2400	-46.680	5.292	-51.972	20
	2480	2483.5	-52.480	3.186	-55.666	20



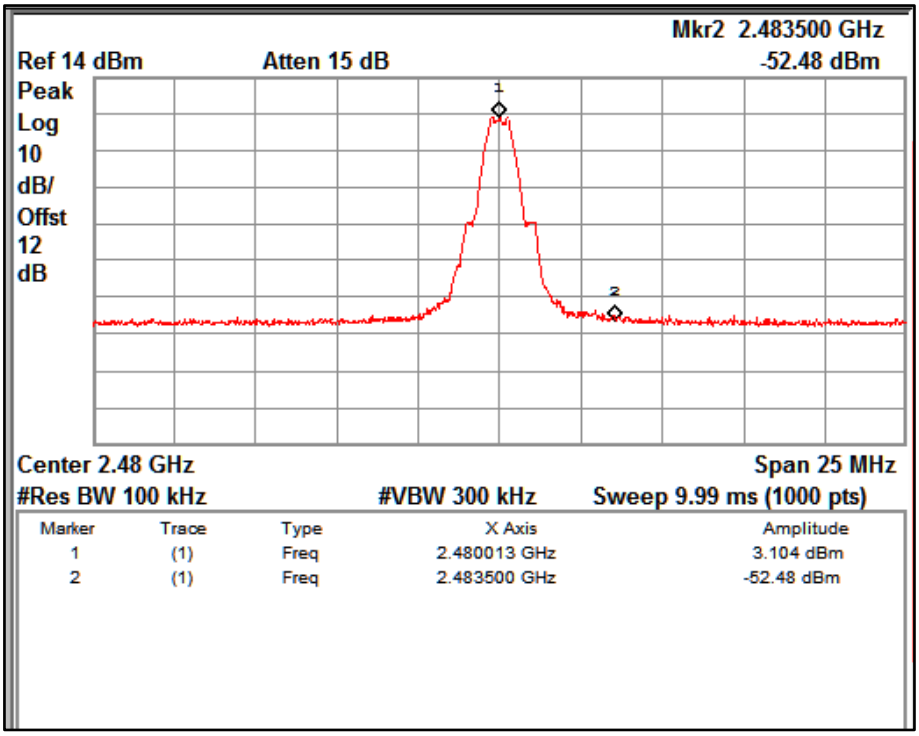
Reference plot: 1Mbps, 2402MHz



Reference plot: 1Mbps, 2480MHz



Data rate: 1Mbps Channel Frequency: 2402MHz



Data rate: 1Mbps Channel Frequency: 2480MHz

7.5 Spurious Radiated Emissions & Restricted Bands of Operation

Result ***Pass***

Test Specification	FCC Part 15 Subpart C Section 15.247(d) / (15.209 & 15.205)
Test Method	ANSI C 63.10 - 2013
Measurement Location	Semi Anechoic Chamber < 1 GHz Fully Anechoic Chamber > 1 GHz
Measuring Distance	3 m
Detector	QP for frequency below 1 GHz, average for frequency above 1 GHz
Requirement	As per the limits mentioned in the below table

Table 19: Transmitter limits for Radiated emission

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 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/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.

Test Conditions:

Supply Voltage: 110 V AC, 60Hz
Supply Votlage to the Module: 24V DC

Environmental conditions:

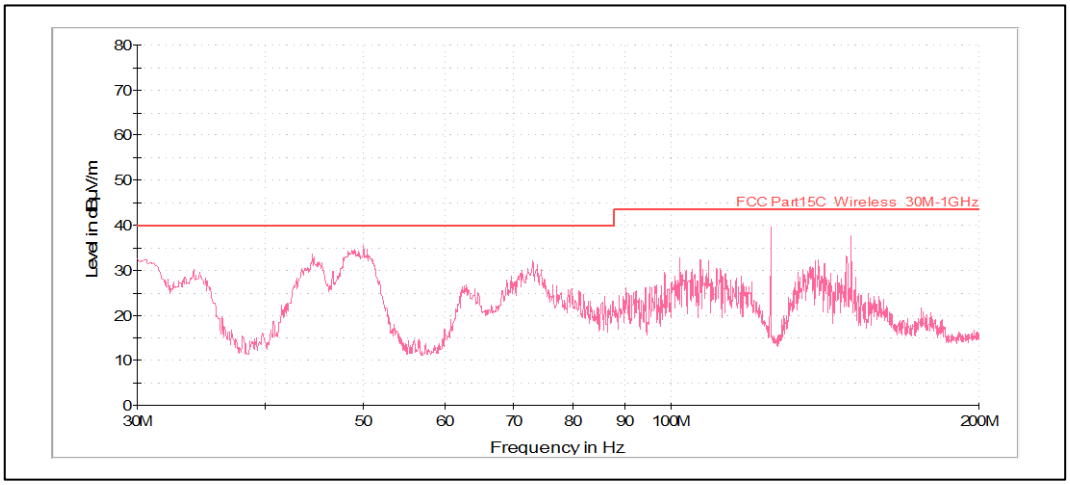
Temperature: +23.5 °C RH: 54 %

Test results:

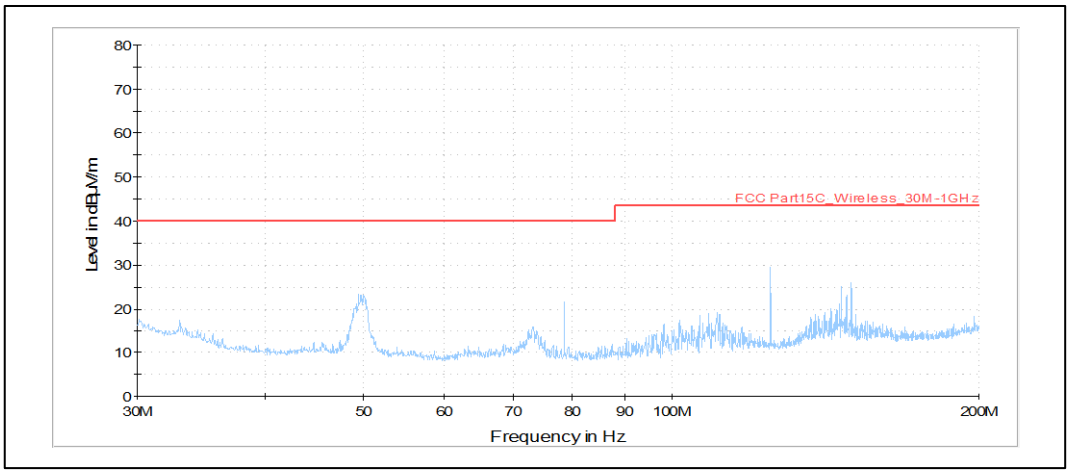
No Emissions found in the frequency range 9kHz – 30MHz

Power Mode: RS232

Frequency range : 30MHz – 200MHz



Polarization: Vertical

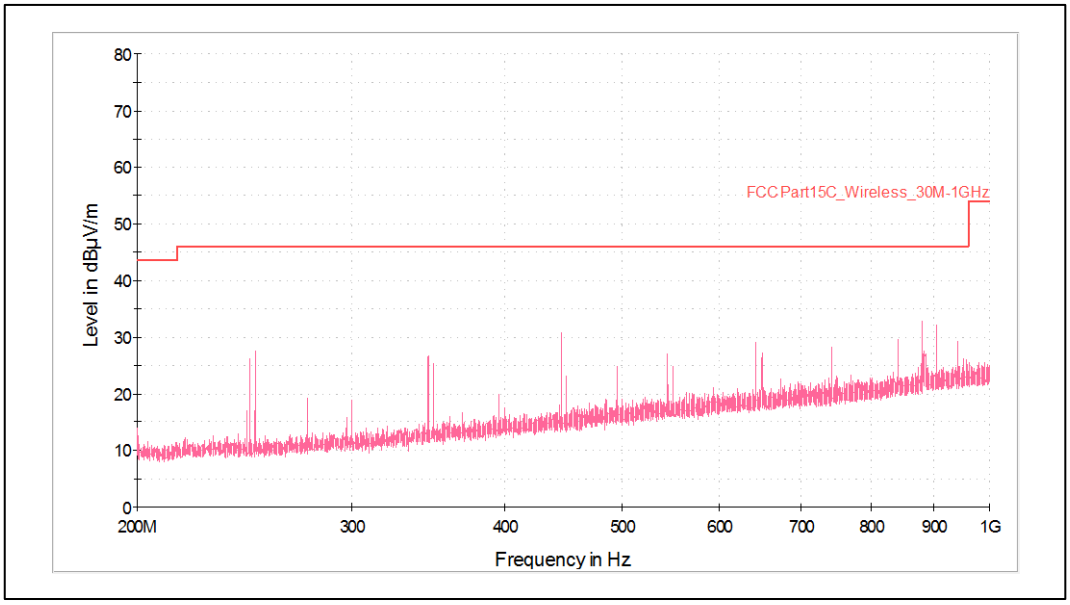


Polarization: Horizontal

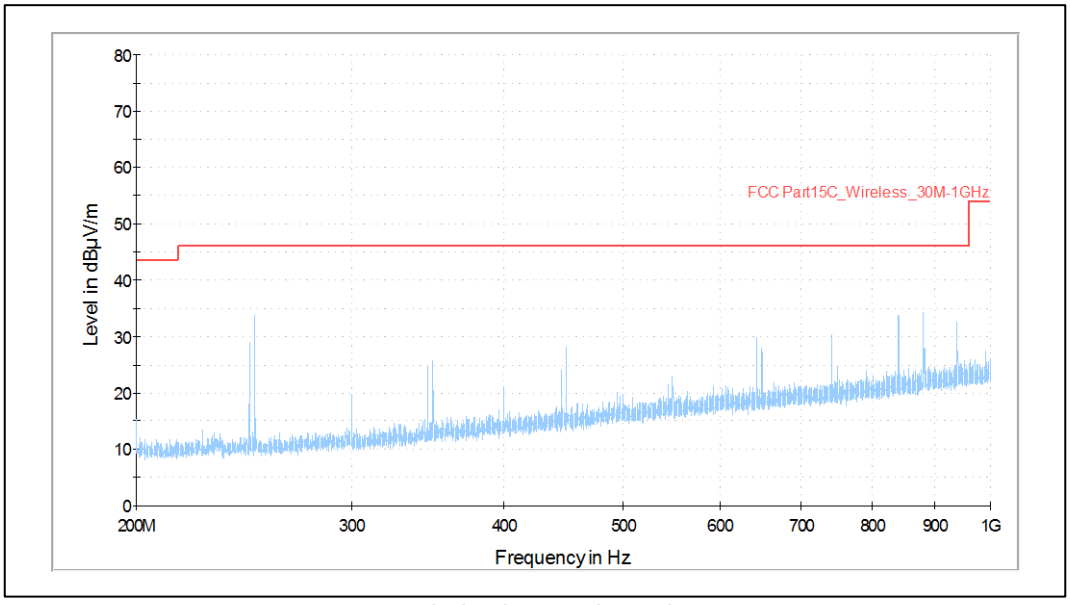
Test results:

Polarization	Measured Frequency (MHz)	Quasi Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	30.60	29.50	40.00	7.57
Vertical	49.97	31.36	40.00	4.43
Vertical	73.16	29.22	40.00	7.83
Horizontal	78.51	4.62	40.00	18.38
Horizontal	124.95	27.07	43.50	14.86
Vertical	125.01	38.36	43.50	3.72
Vertical	149.97	35.88	43.50	5.93

Frequency range : 200MHz – 1GHz



Polarization: Vertical



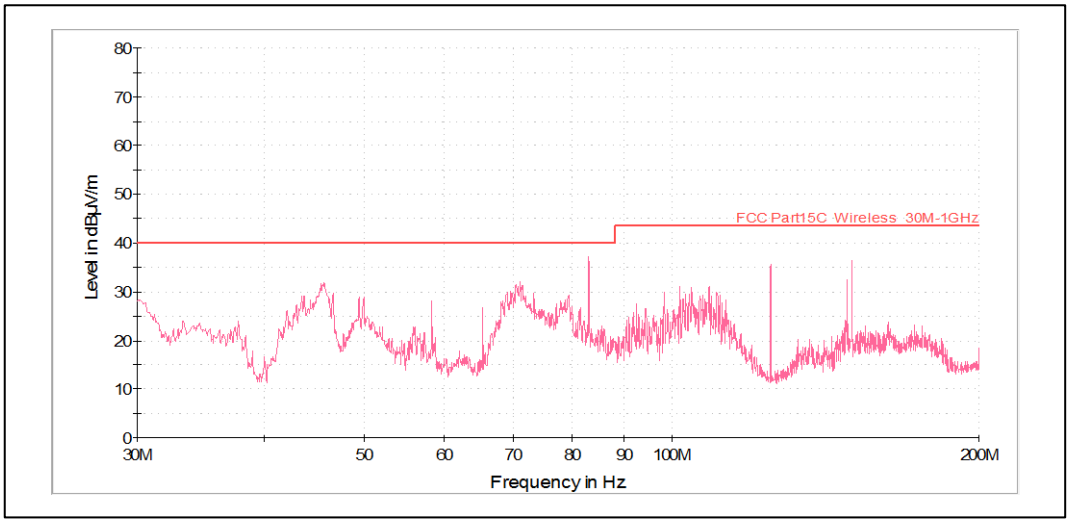
Polarization: Horizontal

Test result :

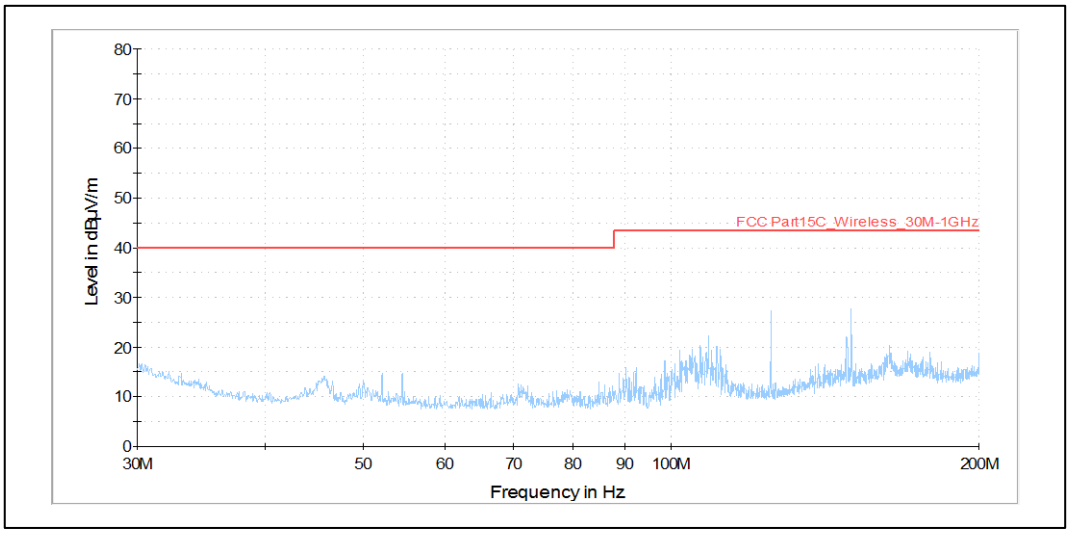
Polarization	Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Horizontal	250.00	33.73	46.00	12.27
Vertical	445.50	27.44	46.00	18.56
Horizontal	841.50	33.83	46.00	12.17
Horizontal	880.60	32.13	46.00	13.87
Vertical	903.55	19.21	46.00	26.79
Horizontal	940.500	30.00	46.00	16.00

Powering by 24V DC:

Frequecy range: 30MHz – 200MHz



Polarization: Vertical

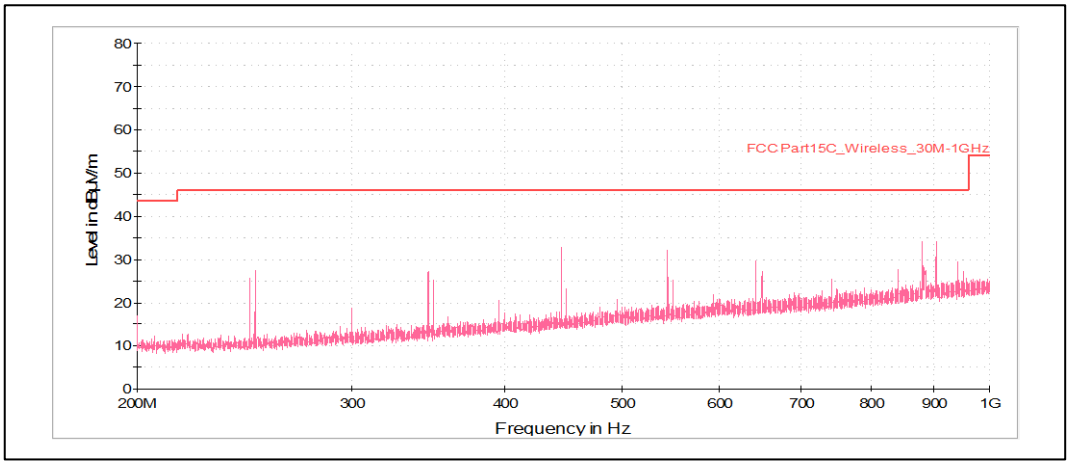


Polarization: Horizontal

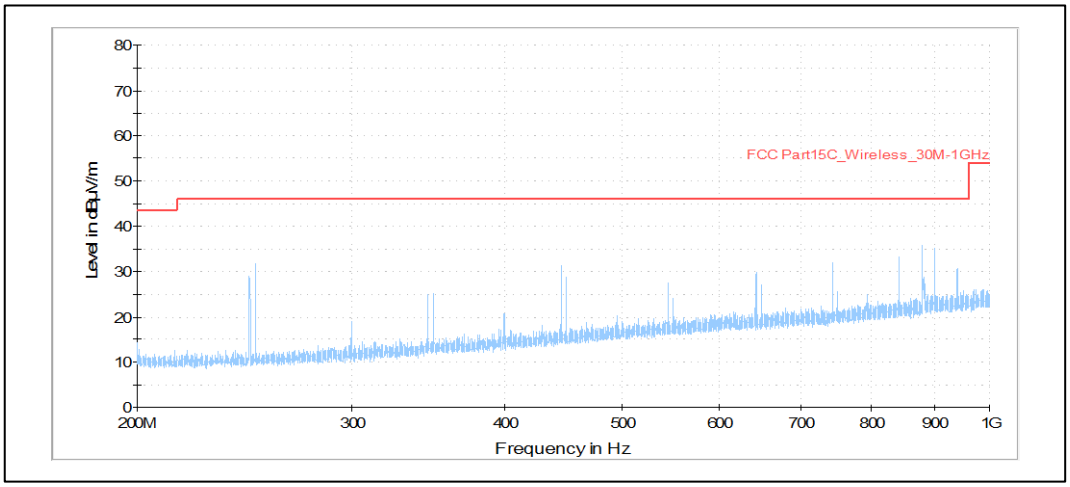
Test results :

Polarization	Measured Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	45.42	24.92	40.00	15.08
Vertical	83.12	17.21	40.00	22.79
Horizontal	124.95	24.11	43.50	19.39
Vertical	125.01	33.59	43.50	9.91
Vertical	148.51	30.58	43.50	12.92
Horizontal	149.97	25.48	43.50	18.02
Vertical	150.03	33.28	43.50	10.22

Frequency range : 200MHz – 1GHz



Polarization: Vertical



Polarization: Horizontal

Test results :

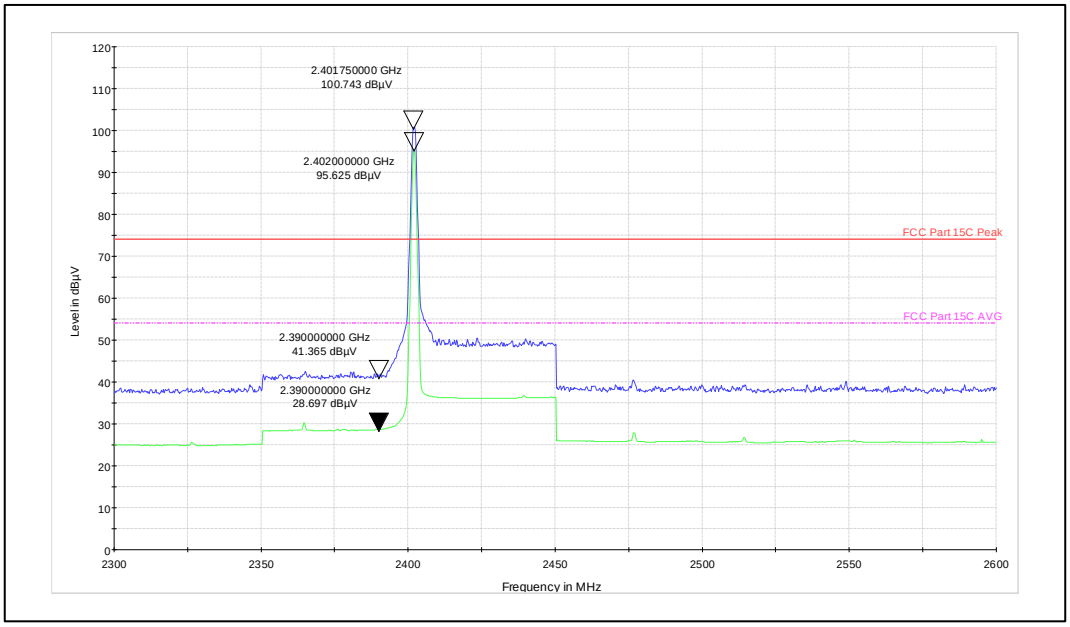
Polarization	Measured Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Vertical	247.45	21.48	46.00	24.52
Horizontal	247.50	28.56	46.00	17.44
Vertical	249.95	19.44	46.00	26.56
Horizontal	250.00	32.22	46.00	13.78
Horizontal	880.60	32.81	46.00	13.19

Frequency range: 1GHz to 26GHz

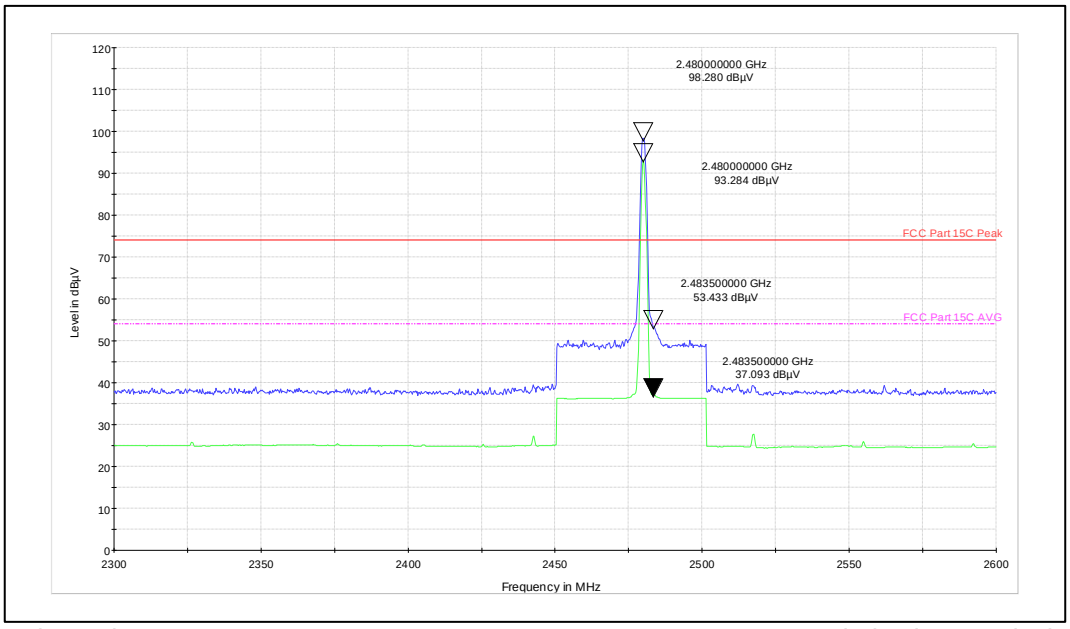
Channel Frequency (MHz)	Measured Frequency (MHz)	Polarization	Measured Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2402	2390(Pk)	Vertical	41.37	74	-32.64
	2390(Av)		28.70	54	-25.30
	2402(Pk)		100.74	*	-
	2402(Av)		95.63	*	-
	4804(Pk)		45.30	74	-28.70
	4804(Av)		30.84	54	-23.16
	7206(Pk)		No Harmonics Found		
	7206(Av)				
	2390(Pk)	Horizontal	40.98	74	-33.02
	2390(Av)		28.70	54	-25.30
	2402(Pk)		101.06	*	-
	2402(Av)		95.93	*	-
	4804(Pk)		42.31	74	-31.69
	4804(Av)		29.86	54	-24.14
	7206(Pk)		No Harmonics Found		
	7206(Av)				
2440	2440(Pk)	Vertical	100.03	*	-
	2440(Av)		94.91	*	-
	4880(Pk)		44.99	74	-29.01
	4880(Av)		31.08	54	-22.92
	7320(Pk)		No Harmonics Found		
	7320(Av)				
	2440(Pk)	Horizontal	99.06	*	-
	2440(Av)		93.94	*	-
	4880(Pk)		42.33	74	-31.67
	4880(Av)		29.03	54	-24.97
	7320(Pk)		No Harmonics Found		
	7320(Av)				
2480	2480(Pk)	Vertical	98.28	*	-
	2480(Av)		93.28	*	-
	2483.5(Pk)		53.43	74	-20.57
	2483.5(Av)		37.09	54	-16.91
	4960(Pk)		43.88	74	-30.12
	4960(Av)		31.19	54	-22.81
	7440(Pk)		No Harmonics Found		
	7440(Av)				
	2480(Pk)	Horizontal	102.07	*	-
	2480(Av)		89.06	*	-
	2483.5(Pk)		60.30	74	-13.70
	2483.5(Av)		38.72	54	-15.28
	4960(Pk)		44.40	74	-29.60
	4960(Av)		31.22	54	-22.78
	7440(Pk)		No Harmonics Found		
	7440(Av)				

***- : Fundamental Frequency**
Pk: Peak Detector; Av: Average Detector

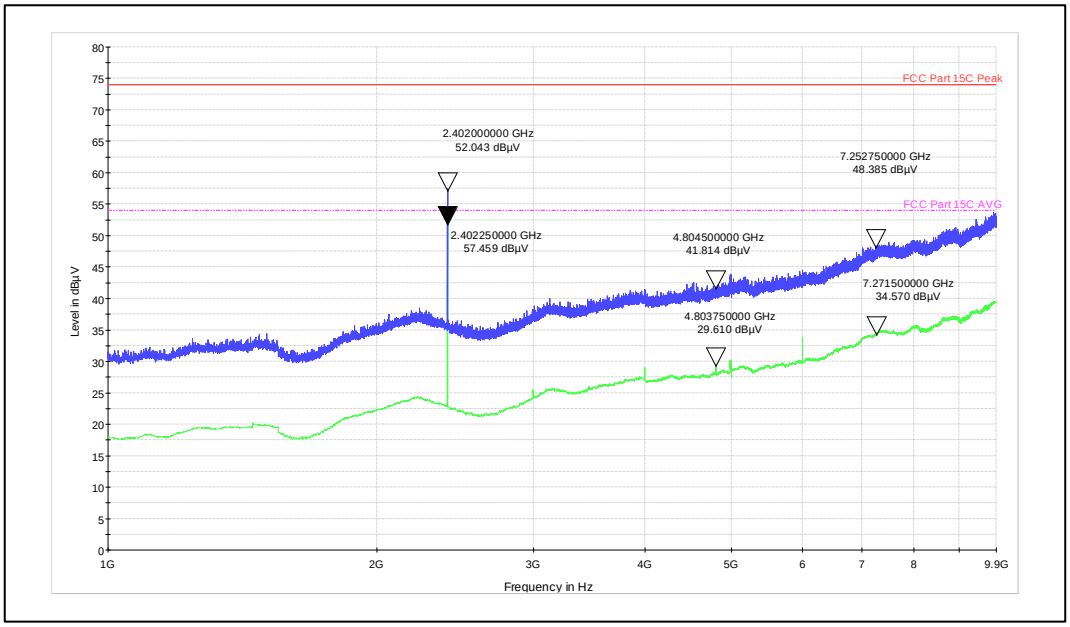
Worst case plots:



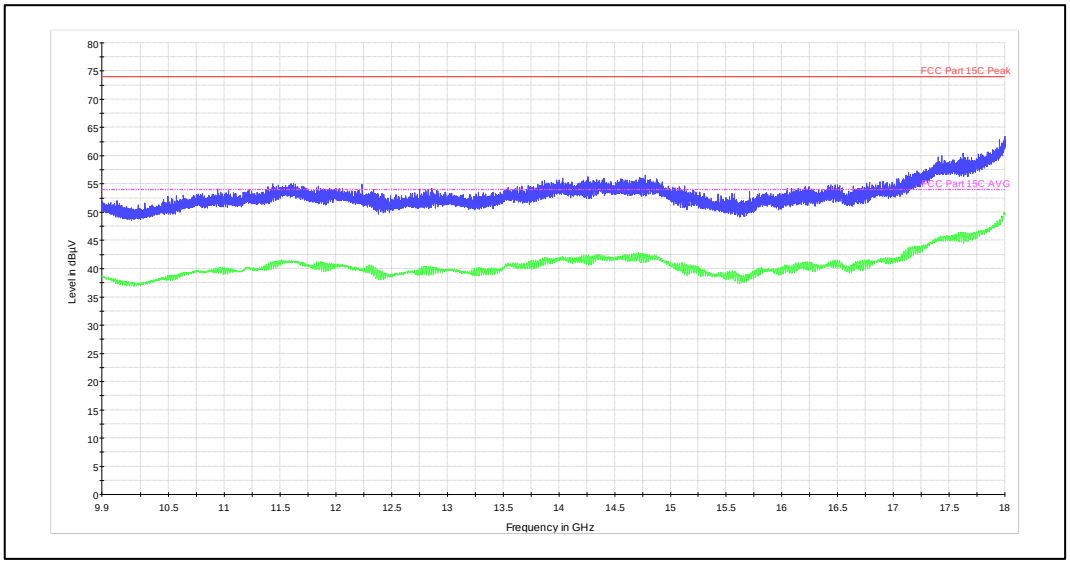
Channel Frequency: 2402MHz Polarization: Vertical



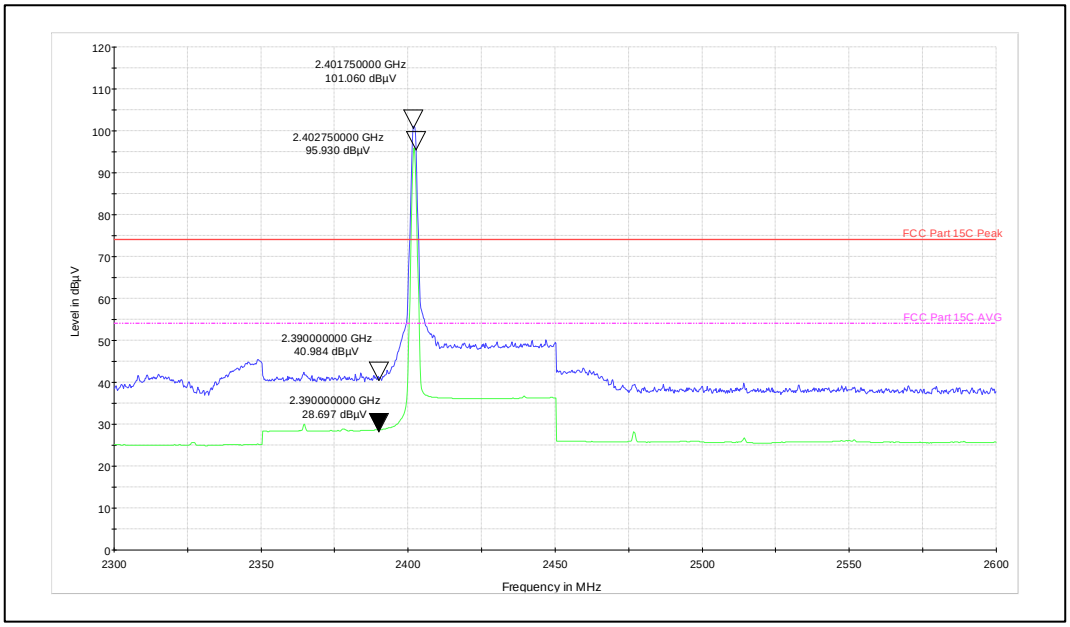
Channel Frequency: 2480MHz Polarization: Vertical



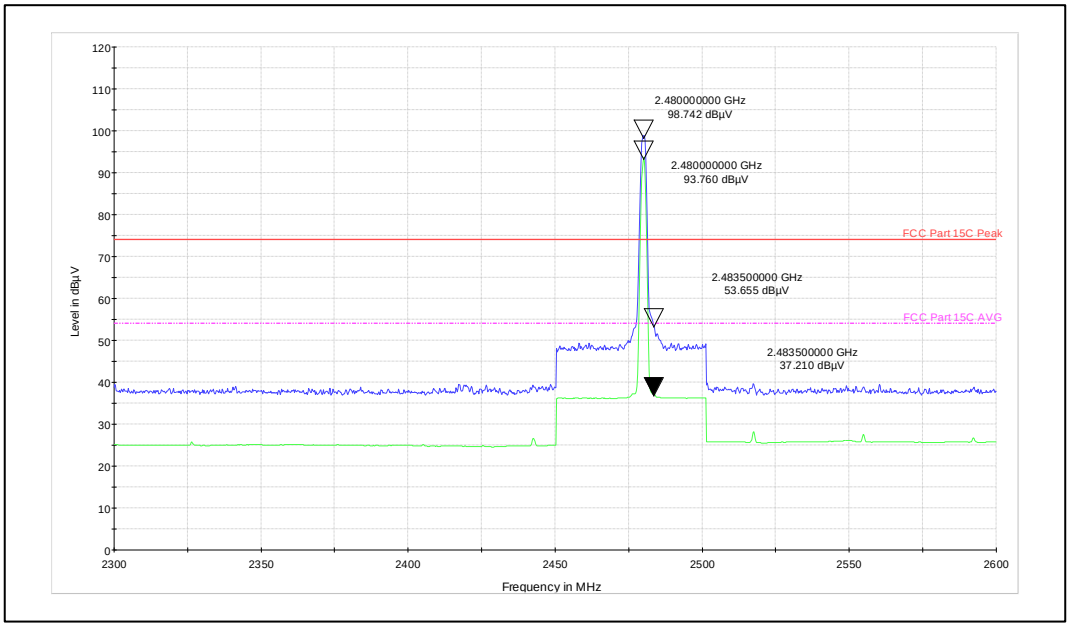
Frequency Range: 1-9.9GHz Polarization: Vertical



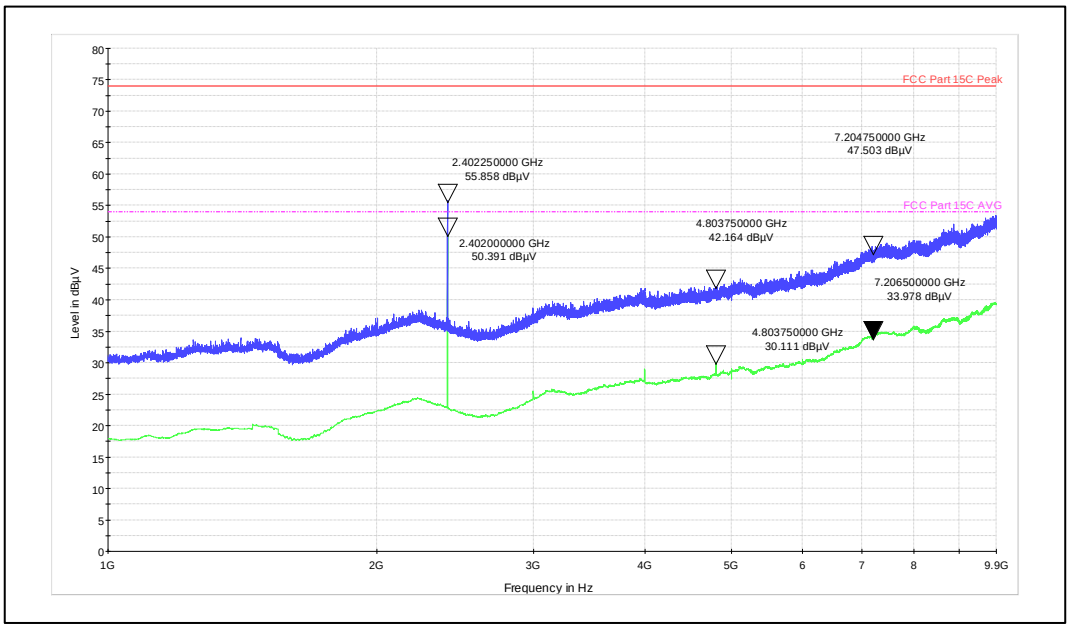
Frequency Range: 9.9-18GHz Polarization: Vertical



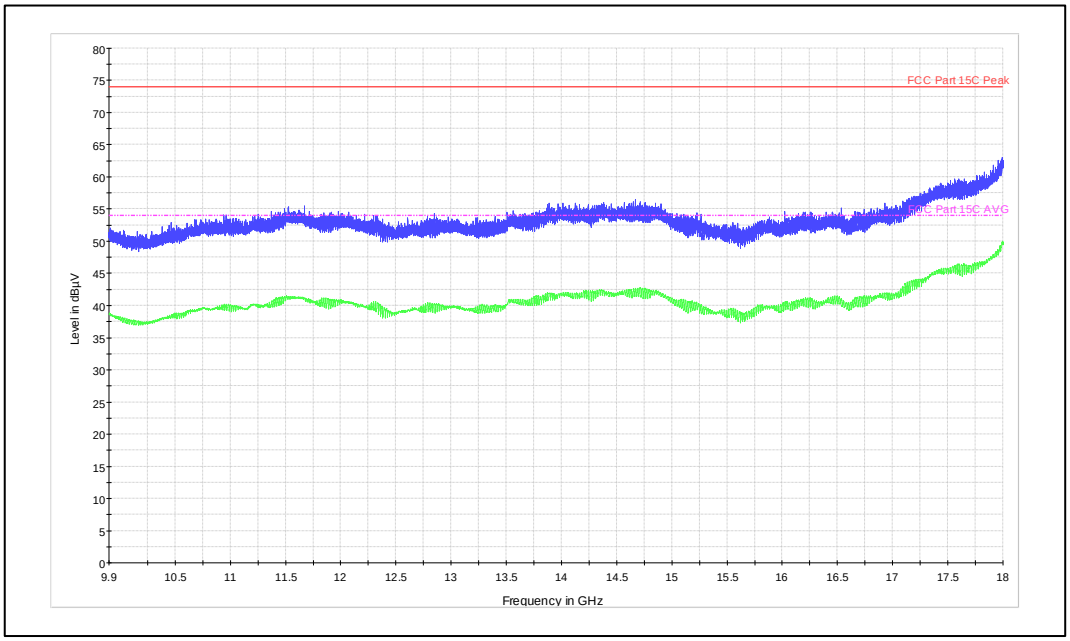
Channel Frequency: 2480MHz Polarization: Horizontal



Channel Frequency: 2480MHz Polarization: Horizontal



Frequency Range: 1-9.9GHz Polarization: Horizontal



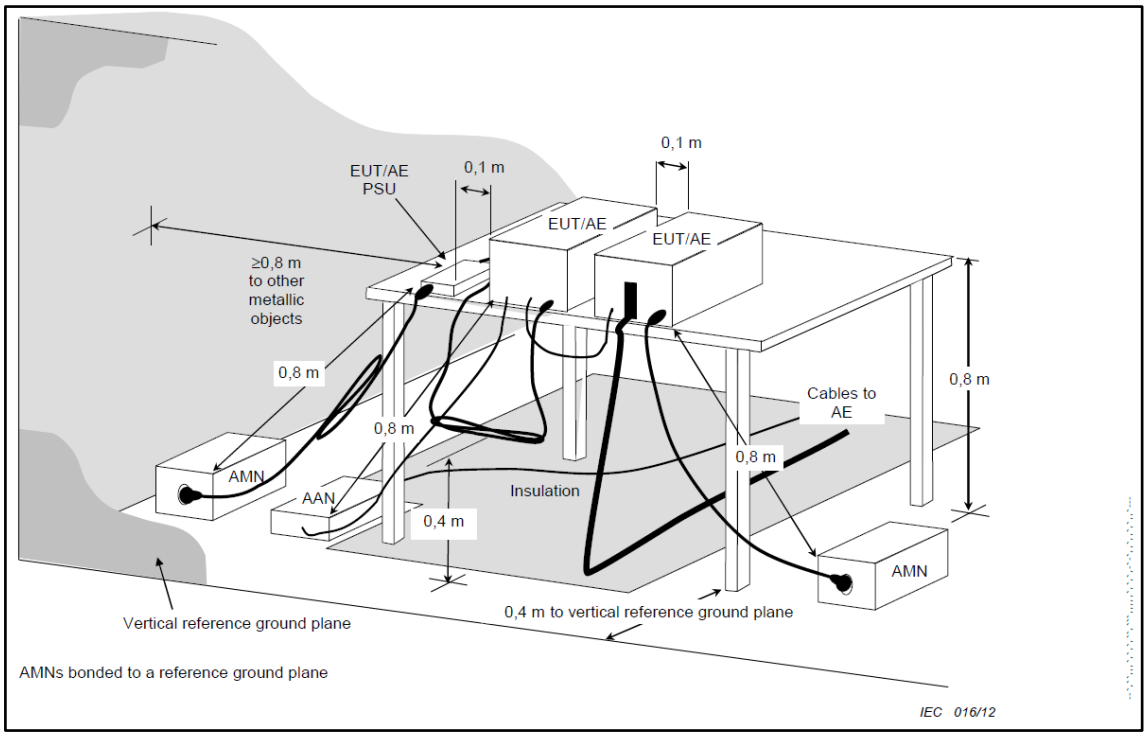
Frequency Range: 9.9-18GHz Polarization: Horizontal

8 Conducted Spurious Emission Test on AC Power Line

Result ***Pass***

Test Specification	:	FCC Part 15 Section 15.207
Test Method	:	ANSI C 63.10-2013
Testing Location	:	Screened room
Measurement Bandwidth	:	9kHz
Frequency Range	:	150kHz – 30MHz
Supply Voltage	:	110VAC,60Hz

Test setup



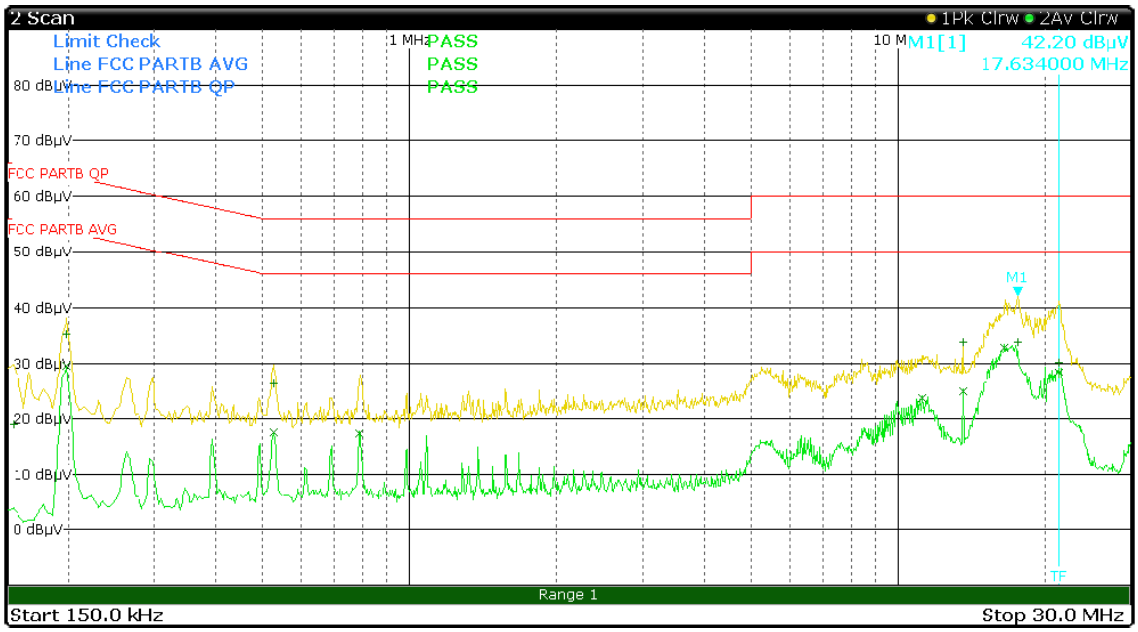
Limits of section 15.207

Frequency of emission (MHz)	QP Limit (dBµV)	AV Limit (dBµV/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

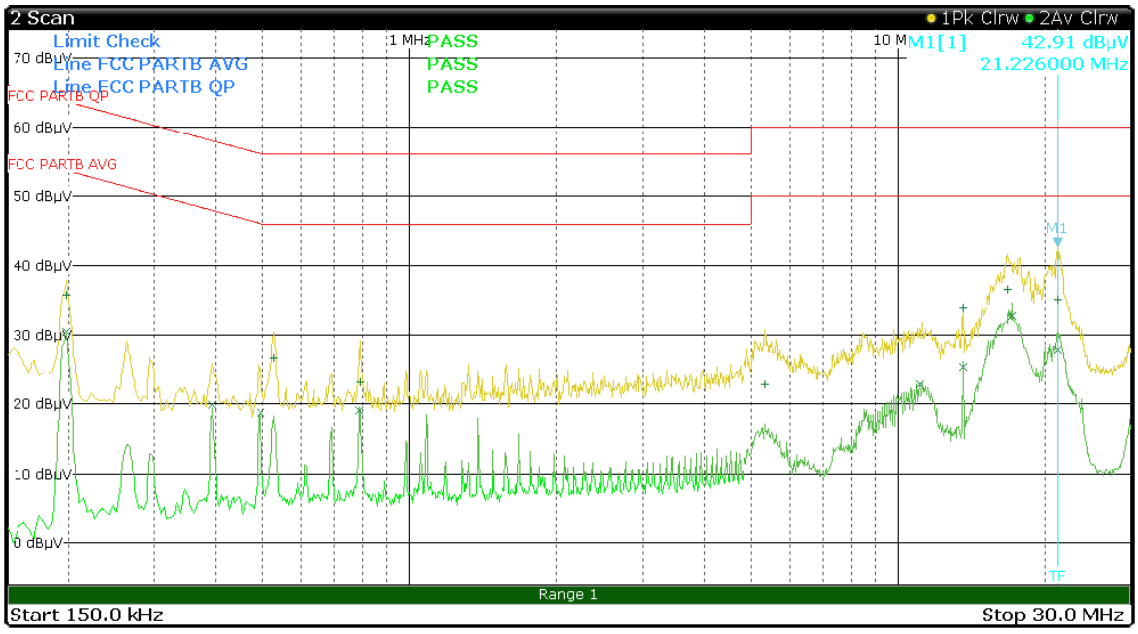
Test result:

Powering by RS232



Graph: Line

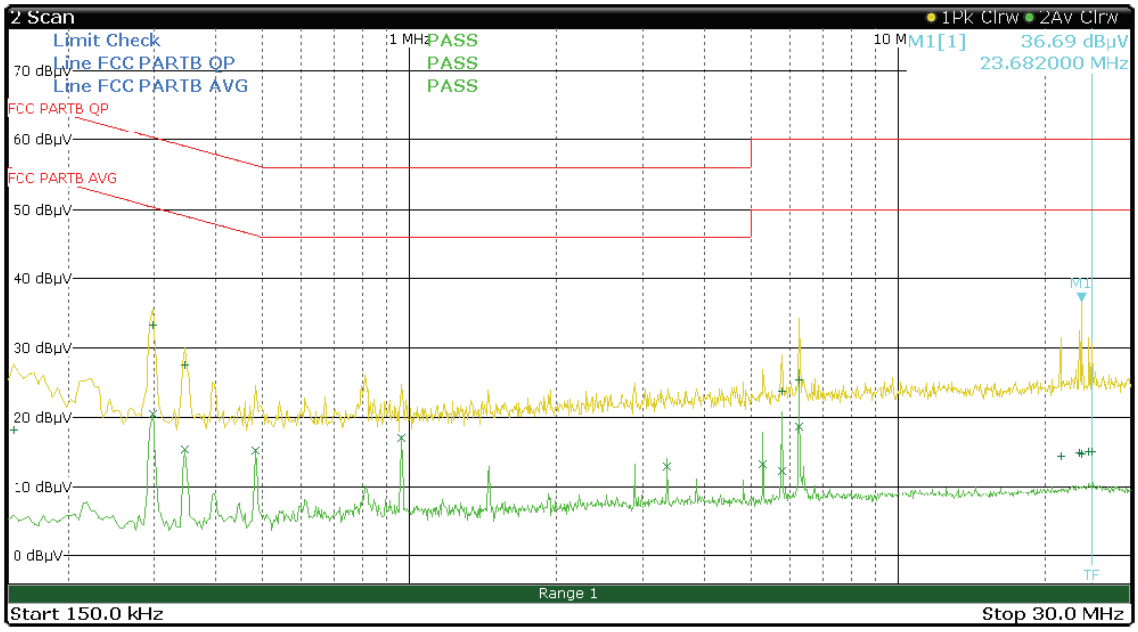
Trace	Frequency	Level	Delta Limit
2	16526000, 000000 Hz	32,830000 dB◆V	-17,170000 dB◆V
2	21282000, 000000 Hz	28,320000 dB◆V	-21,680000 dB◆V
2	198000, 000000 Hz	29,530000 dB◆V	-24,164036 dB◆V
2	13558000, 000000 Hz	24,770000 dB◆V	-25,230000 dB◆V
1	13562000, 000000 Hz	33,770000 dB◆V	-26,230000 dB◆V
1	17634000, 000000 Hz	33,740000 dB◆V	-26,260000 dB◆V
2	11186000, 000000 Hz	23,610000 dB◆V	-26,390000 dB◆V
2	526000, 000000 Hz	17,560000 dB◆V	-28,440000 dB◆V
1	198000, 000000 Hz	35,120000 dB◆V	-28,574036 dB◆V
2	786000, 000000 Hz	17,300000 dB◆V	-28,700000 dB◆V
1	526000, 000000 Hz	26,290000 dB◆V	-29,710000 dB◆V
1	21354000, 000000 Hz	30,190000 dB◆V	-29,810000 dB◆V
1	154000, 000000 Hz	18,990000 dB◆V	-46,791413 dB◆V



Graph: Neutral

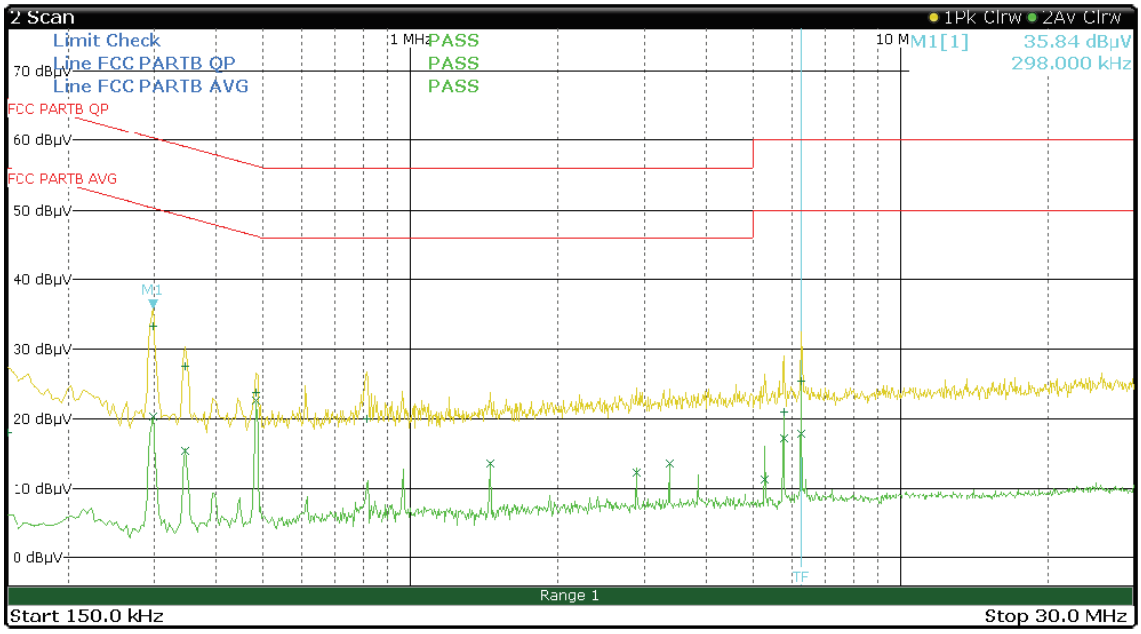
Trace	Frequency	Level	Delta Limit
2	17118000, 000000 Hz	32,760000 dBµV	-17,240000 dBµV
2	21226000, 000000 Hz	27,950000 dBµV	-22,050000 dBµV
2	198000, 000000 Hz	30,450000 dBµV	-23,244036 dBµV
1	16818000, 000000 Hz	36,500000 dBµV	-23,500000 dBµV
2	13562000, 000000 Hz	25,370000 dBµV	-24,630000 dBµV
1	21226000, 000000 Hz	35,000000 dBµV	-25,000000 dBµV
1	13562000, 000000 Hz	33,990000 dBµV	-26,010000 dBµV
2	786000, 000000 Hz	19,100000 dBµV	-26,900000 dBµV
2	11086000, 000000 Hz	22,900000 dBµV	-27,100000 dBµV
2	494000, 000000 Hz	18,750000 dBµV	-27,350273 dBµV
1	198000, 000000 Hz	35,660000 dBµV	-28,034036 dBµV
2	394000, 000000 Hz	19,900000 dBµV	-28,078925 dBµV
1	526000, 000000 Hz	26,700000 dBµV	-29,300000 dBµV
1	790000, 000000 Hz	23,230000 dBµV	-32,770000 dBµV
1	5330000, 000000 Hz	22,870000 dBµV	-37,130000 dBµV

Powering by 24V



Graph: Line

Trace	Frequency	Level	Delta Limit
1	298000.000000 Hz	33.380000 dBµV	-26.918391 dBµV
2	962000.000000 Hz	16.950000 dBµV	-29.050000 dBµV
2	298000.000000 Hz	20.470000 dBµV	-29.828391 dBµV
2	482000.000000 Hz	15.210000 dBµV	-31.094525 dBµV
2	6266000.000000 Hz	18.700000 dBµV	-31.300000 dBµV
1	346000.000000 Hz	27.630000 dBµV	-31.427954 dBµV
2	3370000.000000 Hz	12.890000 dBµV	-33.110000 dBµV
2	346000.000000 Hz	15.430000 dBµV	-33.627954 dBµV
1	6278000.000000 Hz	25.320000 dBµV	-34.680000 dBµV
1	5778000.000000 Hz	23.770000 dBµV	-36.230000 dBµV
2	5298000.000000 Hz	13.280000 dBµV	-36.720000 dBµV
2	5782000.000000 Hz	12.350000 dBµV	-37.650000 dBµV
1	24958000.000000 Hz	15.030000 dBµV	-44.970000 dBµV
1	24562000.000000 Hz	15.020000 dBµV	-44.980000 dBµV
1	23438000.000000 Hz	14.850000 dBµV	-45.150000 dBµV
1	23682000.000000 Hz	14.740000 dBµV	-45.260000 dBµV
1	21534000.000000 Hz	14.480000 dBµV	-45.520000 dBµV
1	154000.000000 Hz	18.110000 dBµV	-47.671413 dBµV



Graph: Neautral

Trace	Frequency	Level	Delta Limit
2	482000,000000 Hz	22,480000 dBµV	-23,824525 dBµV
1	298000,000000 Hz	33,260000 dBµV	-27,038391 dBµV
2	298000,000000 Hz	20,310000 dBµV	-29,988391 dBµV
1	346000,000000 Hz	27,590000 dBµV	-31,467954 dBµV
2	6258000,000000 Hz	17,840000 dBµV	-32,160000 dBµV
2	1446000,000000 Hz	13,670000 dBµV	-32,330000 dBµV
2	3374000,000000 Hz	13,620000 dBµV	-32,380000 dBµV
1	482000,000000 Hz	23,760000 dBµV	-32,544525 dBµV
2	5778000,000000 Hz	17,140000 dBµV	-32,860000 dBµV
2	346000,000000 Hz	15,440000 dBµV	-33,617954 dBµV
2	2894000,000000 Hz	12,280000 dBµV	-33,720000 dBµV
1	6254000,000000 Hz	25,360000 dBµV	-34,640000 dBµV
1	810000,000000 Hz	19,940000 dBµV	-36,060000 dBµV
2	5294000,000000 Hz	11,300000 dBµV	-38,700000 dBµV
1	5798000,000000 Hz	20,880000 dBµV	-39,120000 dBµV
1	150000,000000 Hz	17,940000 dBµV	-48,060000 dBµV

9 LIST OF TABLES

Power ratings: WLAN 2.4GHz

Mode	Data Rate	Frequency (MHz)	Set Power (dBm)
b	1Mbps	2412	16 for Ant. 1 15 for Ant. 2
		2442	16 for Ant. 1 15 for Ant. 2
		2462	16 for Ant. 1 15 for Ant. 2
	11Mbps	2412	15 for Ant.1 15 for Ant.2
		2442	15 for Ant.1 15 for Ant.2
		2462	15 for Ant.1 15 for Ant.2
g	6Mbps	2412	16 for Ant. 1 15 for Ant. 2
		2442	16 for Ant. 1 15 for Ant. 2
		2462	16 for Ant. 1 15 for Ant. 2
	24Mbps	2412	15 for Ant.1 15 for Ant.2
		2442	15 for Ant.1 15 for Ant.2
		2462	15 for Ant.1 15 for Ant.2
	54Mbps	2412	15 for Ant.1 15 for Ant.2
		2442	15 for Ant.1 15 for Ant.2
		2462	15 for Ant.1 15 for Ant.2

Mode	Data Rate	Frequency (MHz)	Set Power (dBm)
n	MCS0	2412	16 for Ant. 1 15 for Ant. 2
		2442	16 for Ant. 1 15 for Ant. 2
		2462	16 for Ant. 1 15 for Ant. 2
	MCS4	2412	15 for Ant.1 15 for Ant.2
		2442	15 for Ant.1 15 for Ant.2
		2462	15 for Ant.1 15 for Ant.2
	MCS7	2412	15 for Ant.1 15 for Ant.2
		2442	15 for Ant.1 15 for Ant.2
		2462	15 for Ant.1 15 for Ant.2

For BLE defalut power is set to 6dBm

*** END OF TEST REPORT***