3. 6 dB Bandwidth

3.1. Test Setup

3.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902-928 ㎒, 2 400-2 483.5 ㎒, and 5 725-5 850 ㎒ bands. The minimum 6 ㏈ bandwidth shall be at least 500 ㎑.

3.3. Test Procedure

The test follows section 11.8 DTS bandwidth of ANSI C63.10-2013.

Tests performed using section 11.8.1 Option 1.

- Option 1:
1. Set RBW to = 100 ㎑.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 ㏈ relative to the maximum level measured in the fundamental emission.

3.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Test voltage: DC 12 V

Operation Mode	Data Rate (Mbps)	Channel	Frequency (㎒)	6 ㏈ Bandwidth (㎒)
DSSS (802.11b)	1	Low	2 412	10.058
		Middle	2 437	10.058
		High	2 462	9.551
OFDM (802.11g)	6	Low	2 412	16.425
		Middle	2 437	16.353
		High	2 462	16.353
OFDM (802.11n_HT20)	MCS0	Low	2 412	17.511
		Middle	2 437	17.511
		High	2 462	17.511
OFDM (802.11n_HT40)	MCS0	Low	2 422	35.750
		Middle	2 437	35.460
		High	2 452	35.600

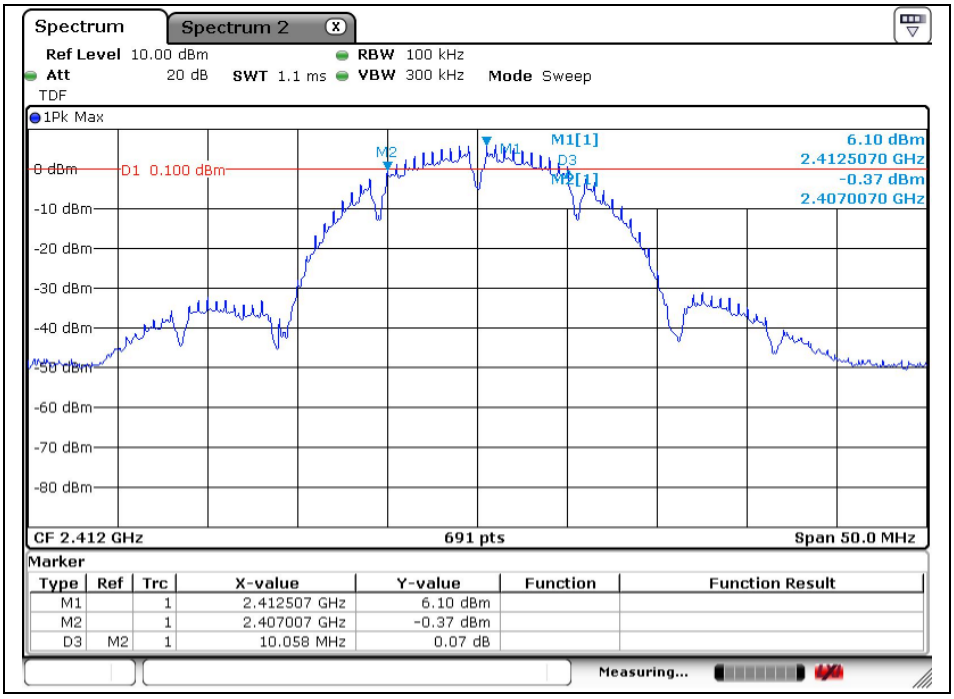
Test voltage: DC 24 V

Operation Mode	Data Rate (Mbps)	Channel	Frequency (㎒)	6 ㏈ Bandwidth (㎒)
DSSS (802.11b)	1	Low	2 412	10.070
		Middle	2 437	10.070
		High	2 462	10.110
OFDM (802.11g)	6	Low	2 412	16.384
		Middle	2 437	16.424
		High	2 462	16.384
OFDM (802.11n_HT20)	MCS0	Low	2 412	17.622
		Middle	2 437	17.582
		High	2 462	17.622
OFDM (802.11n_HT40)	MCS0	Low	2 422	35.804
		Middle	2 437	35.644
		High	2 452	35.724

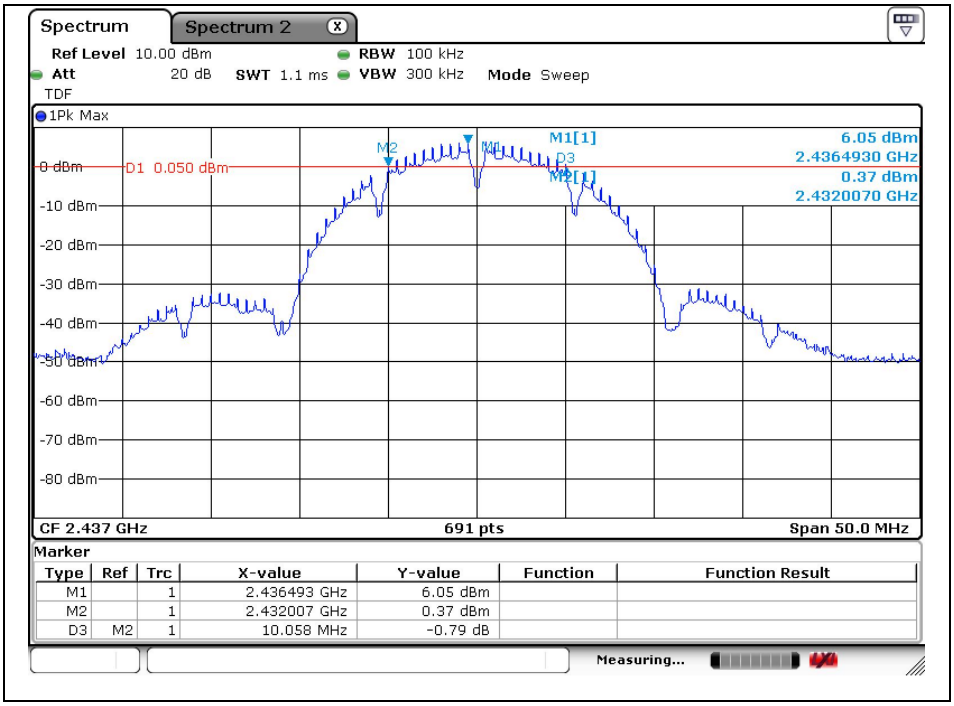
- Test plots

Test voltage: DC 12 V

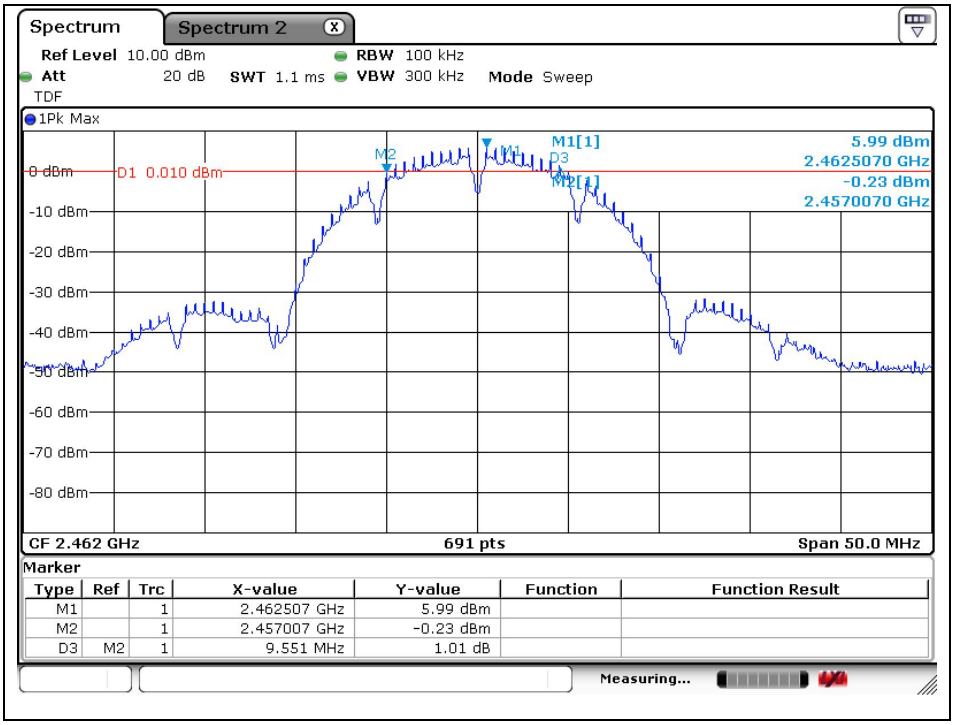
DSSS: 802.11b
Low Channel



Middle Channel

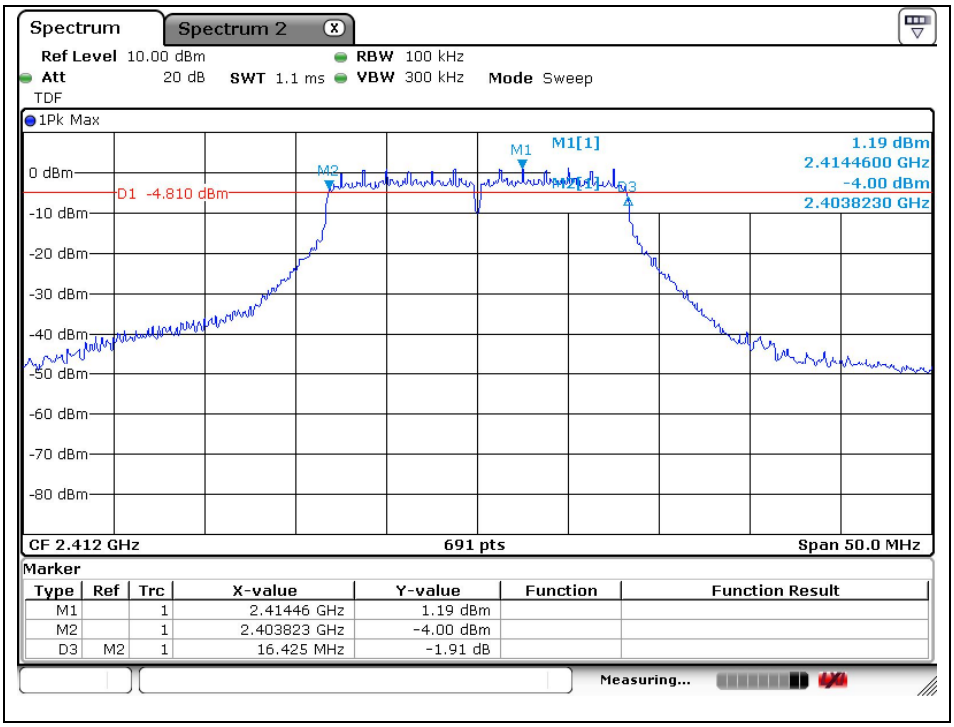


High Channel

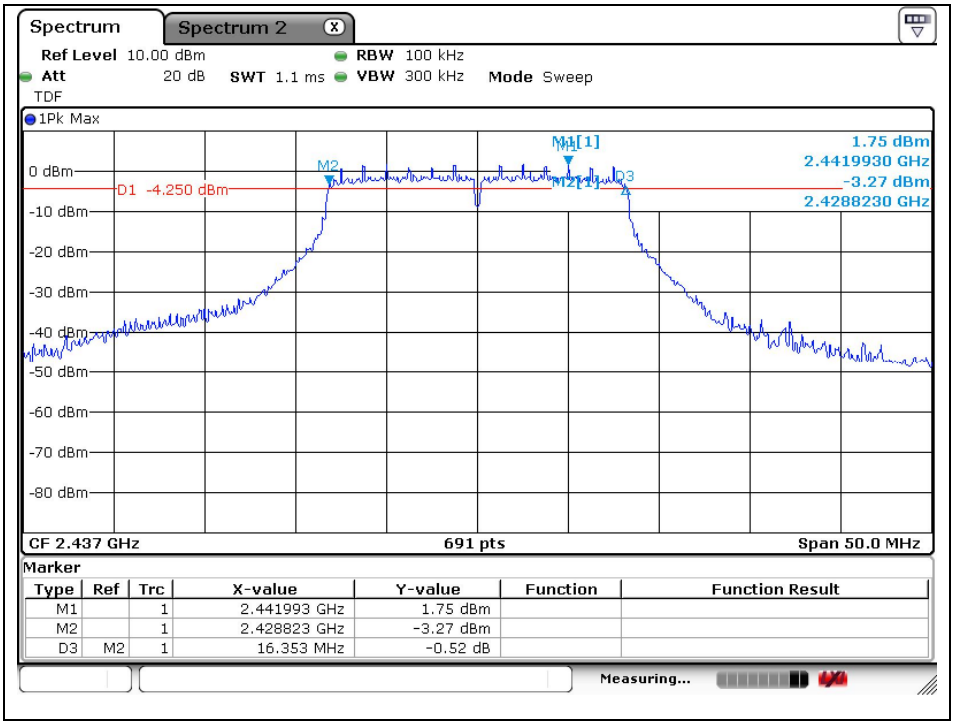


OFDM: 802.11g

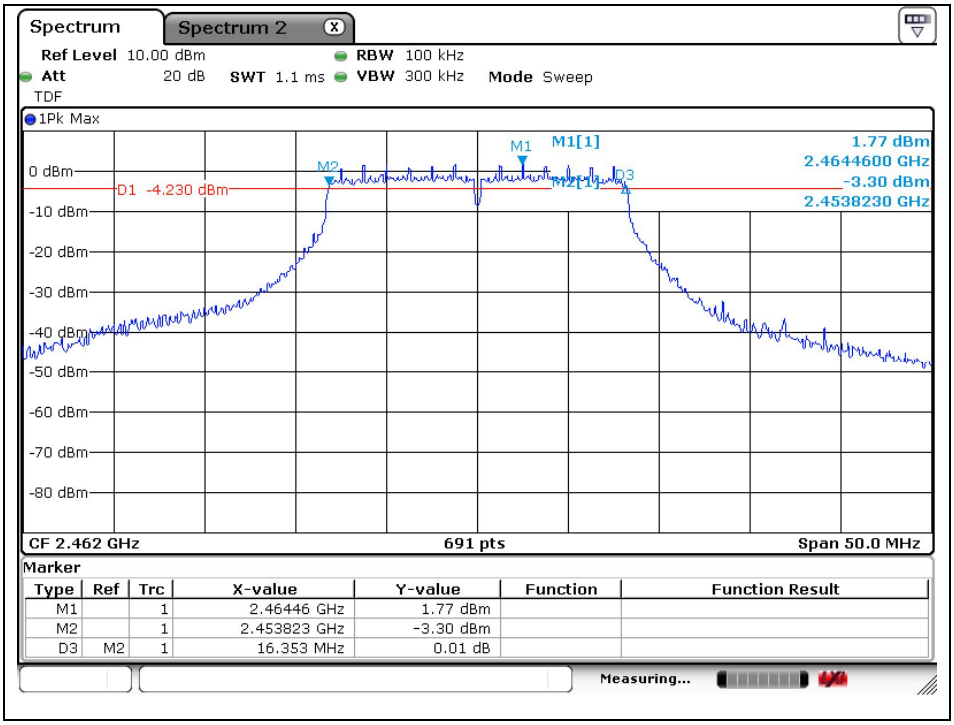
Low Channel



Middle Channel

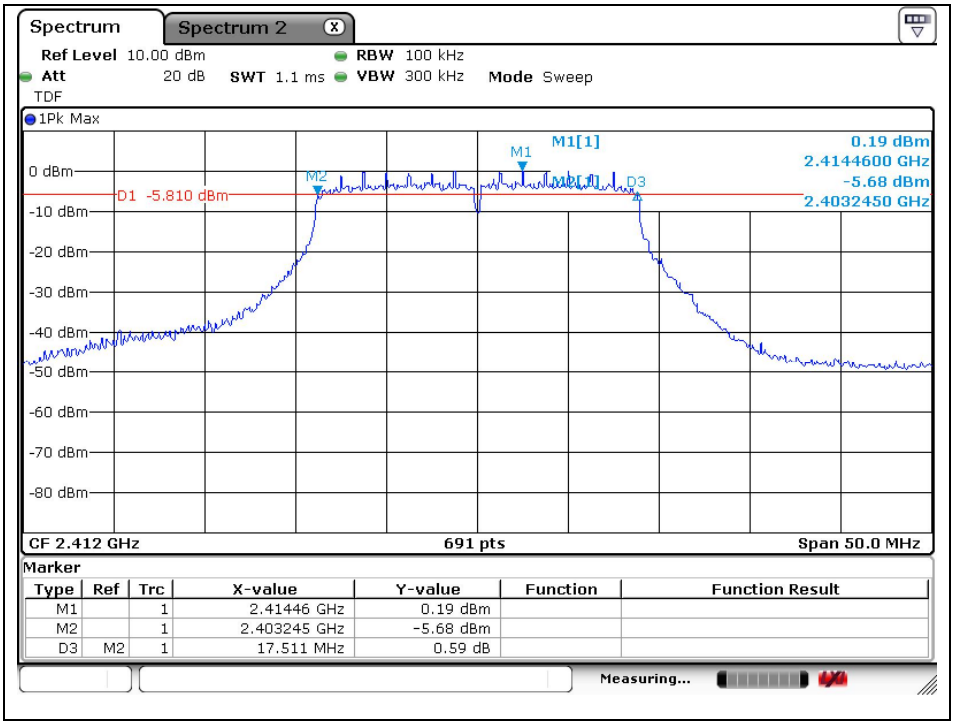


High Channel

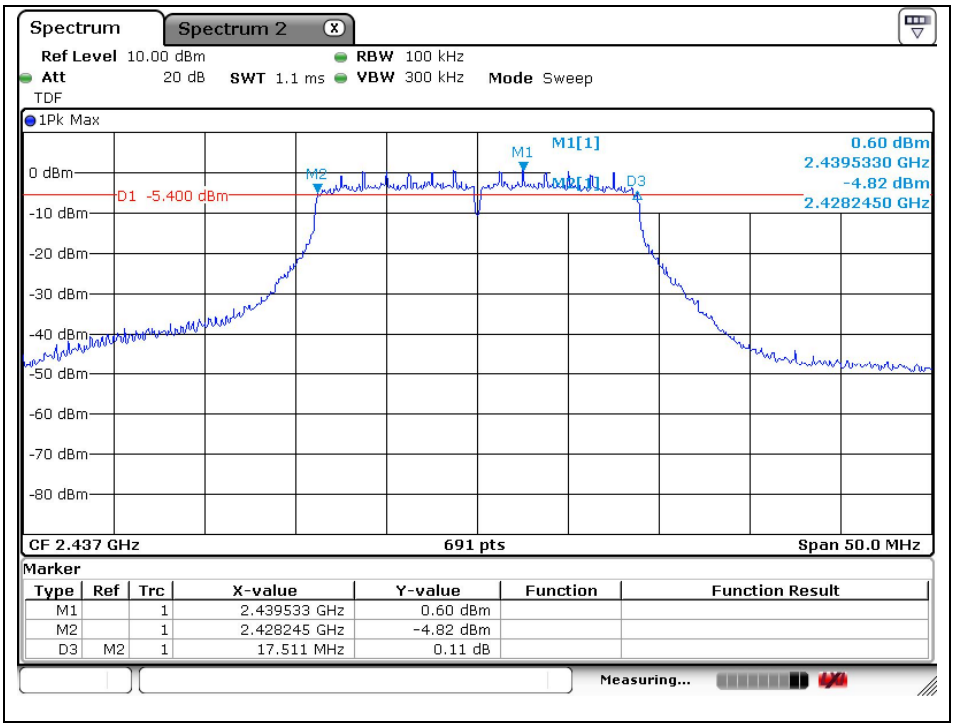


OFDM: 802.11n_HT20

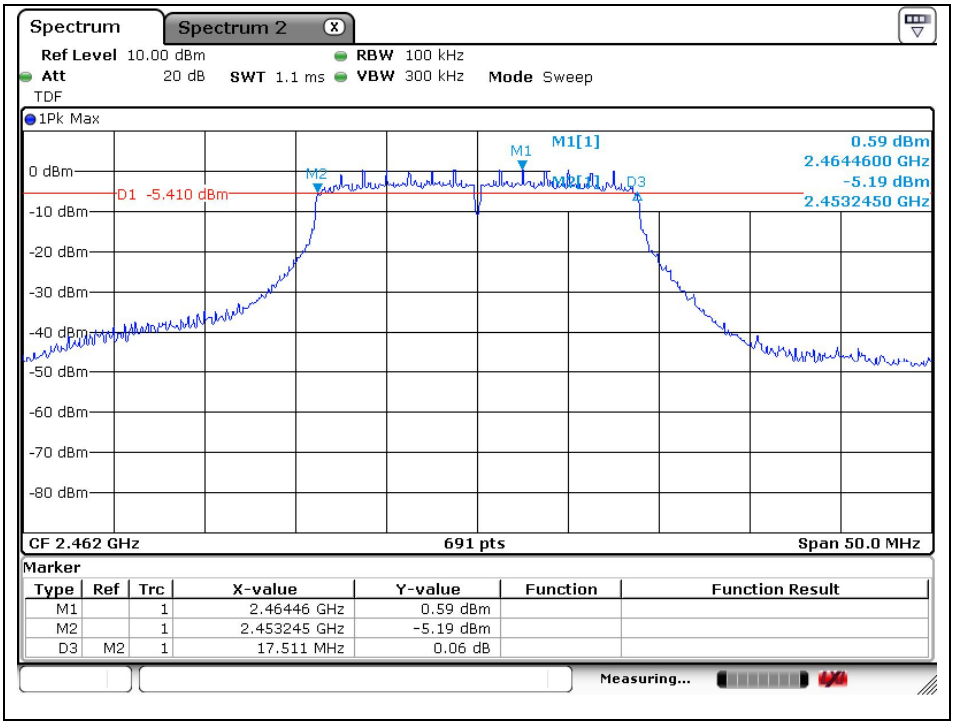
Low Channel



Middle Channel

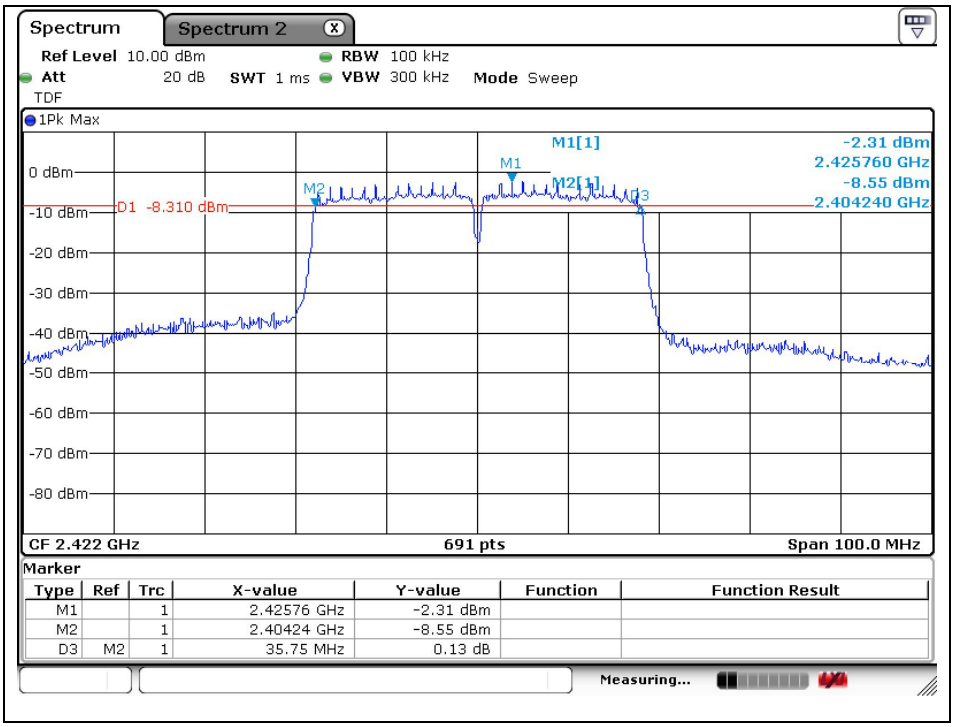


High Channel

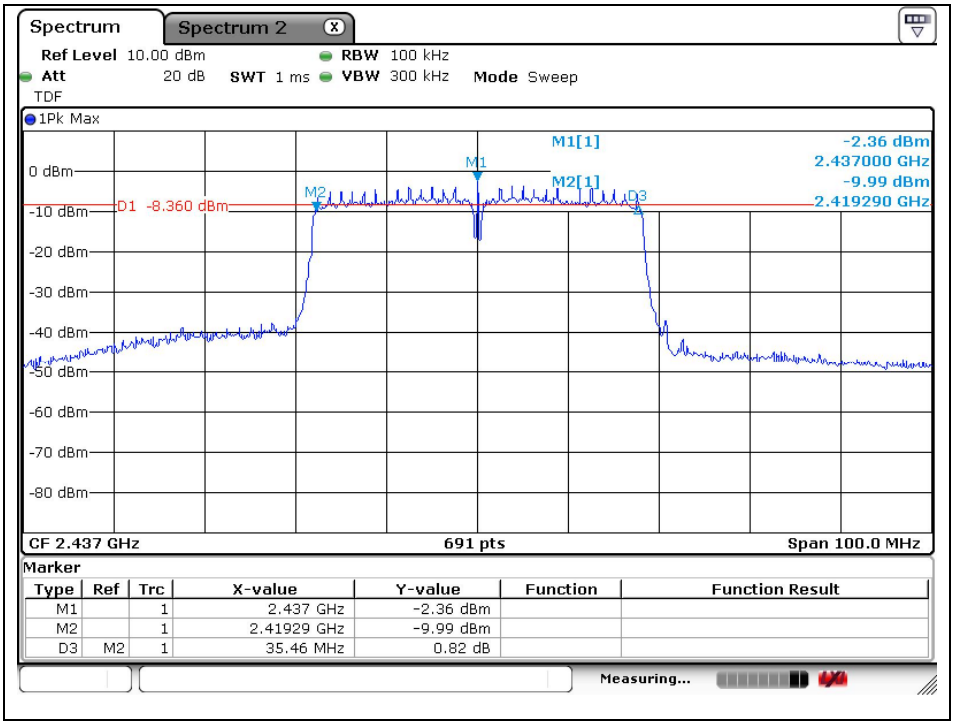


OFDM: 802.11n_HT40

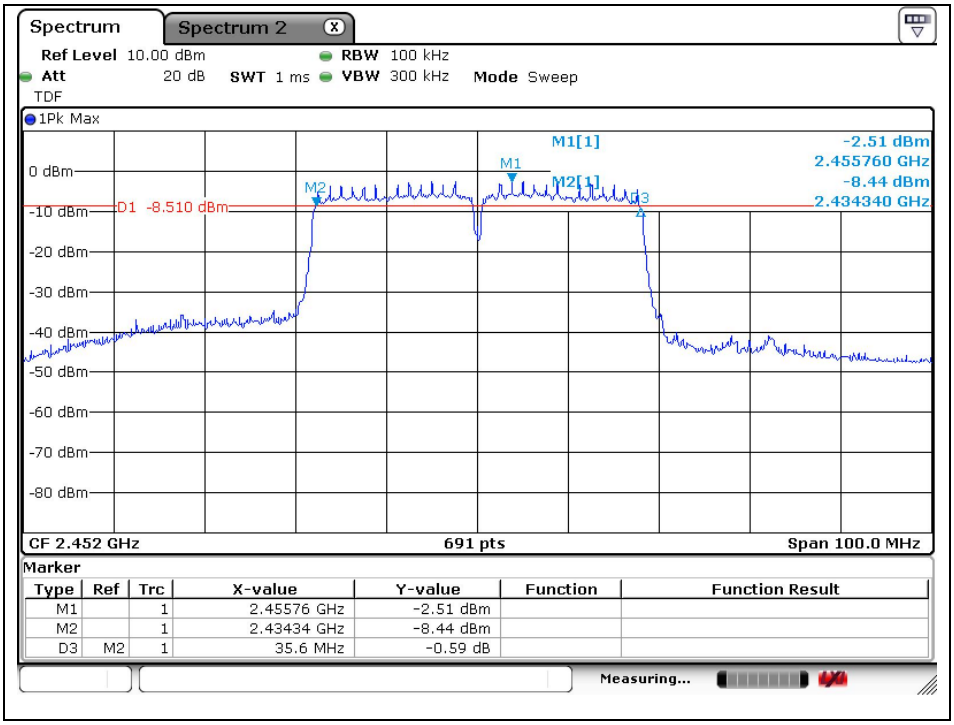
Low Channel



Middle Channel



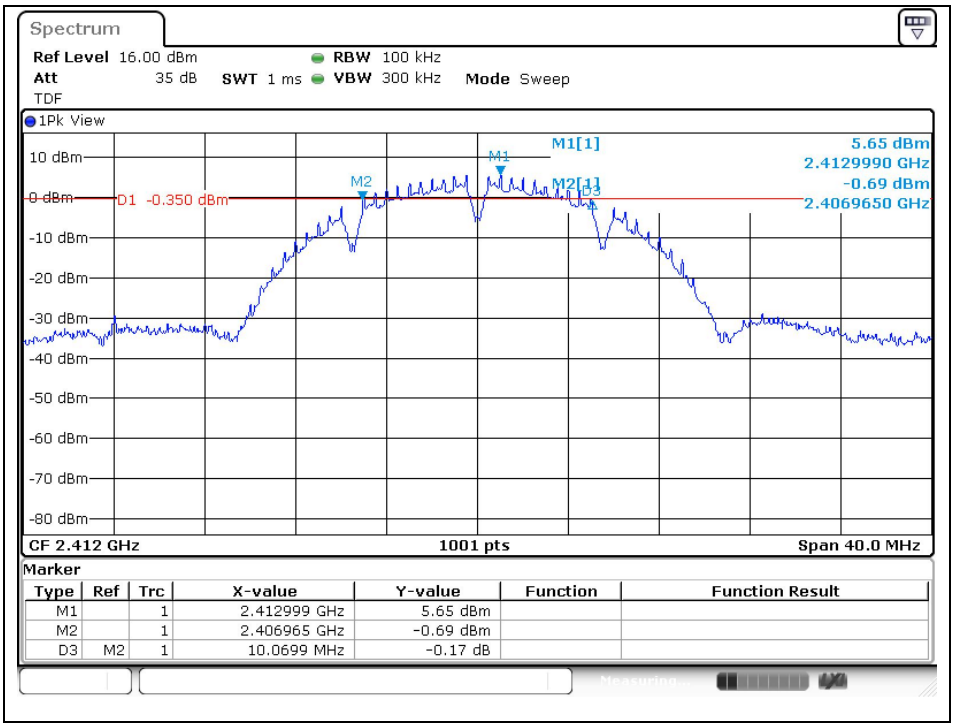
High Channel



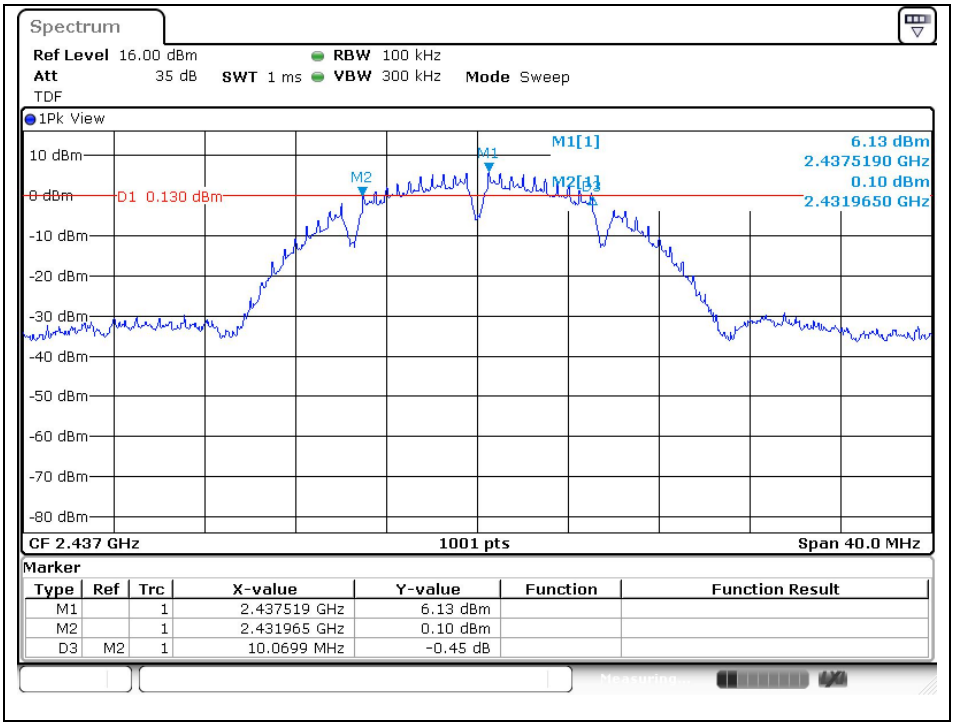
Test voltage: DC 24 V

DSSS: 802.11b

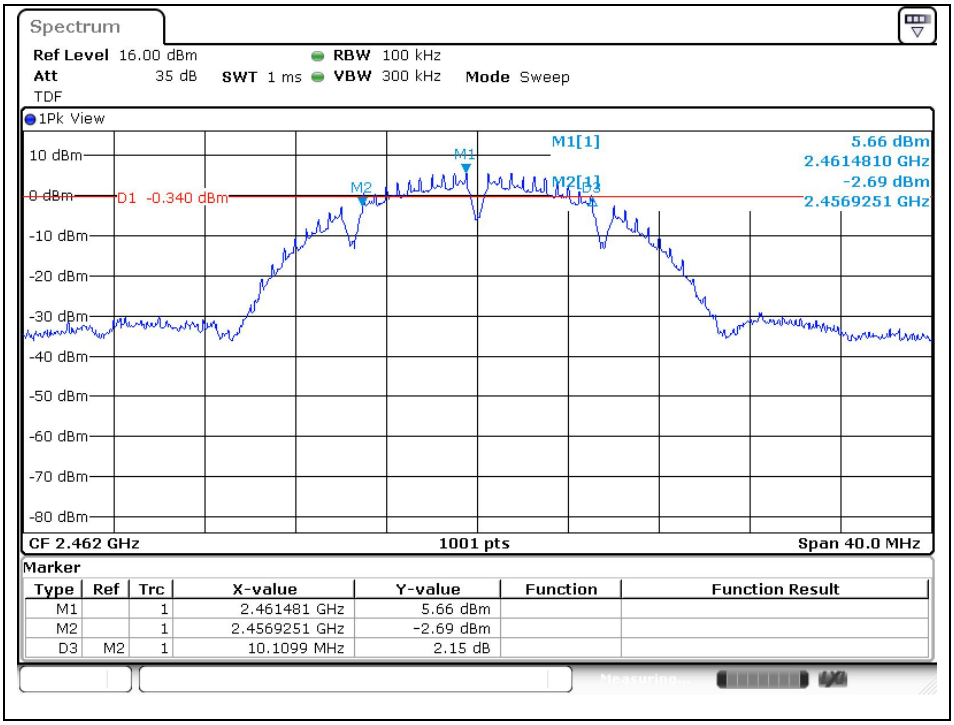
Low Channel



Middle Channel

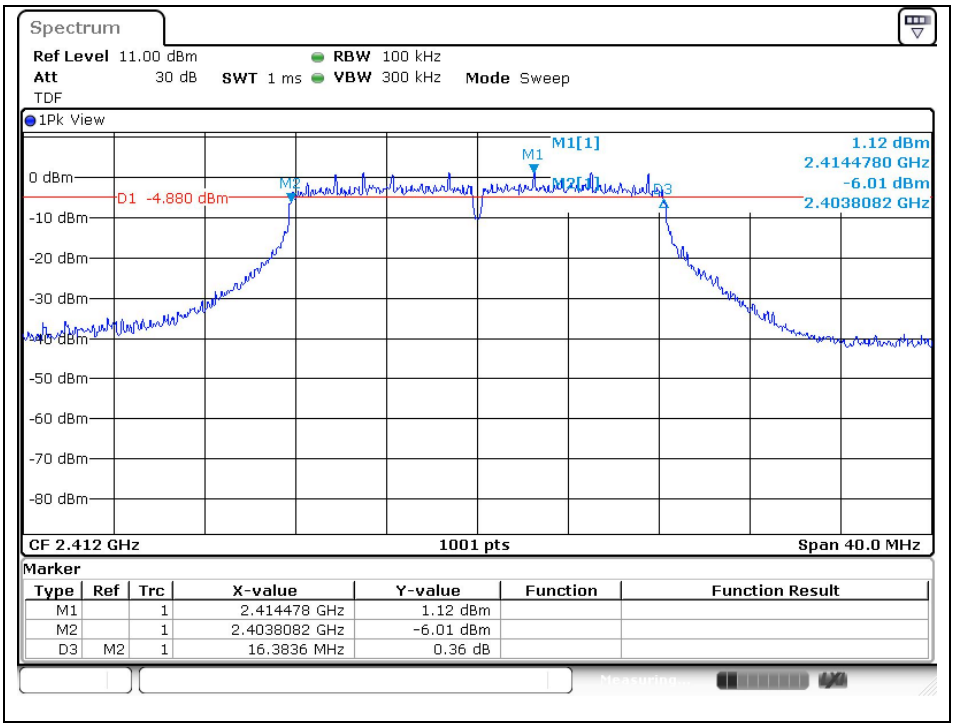


High Channel

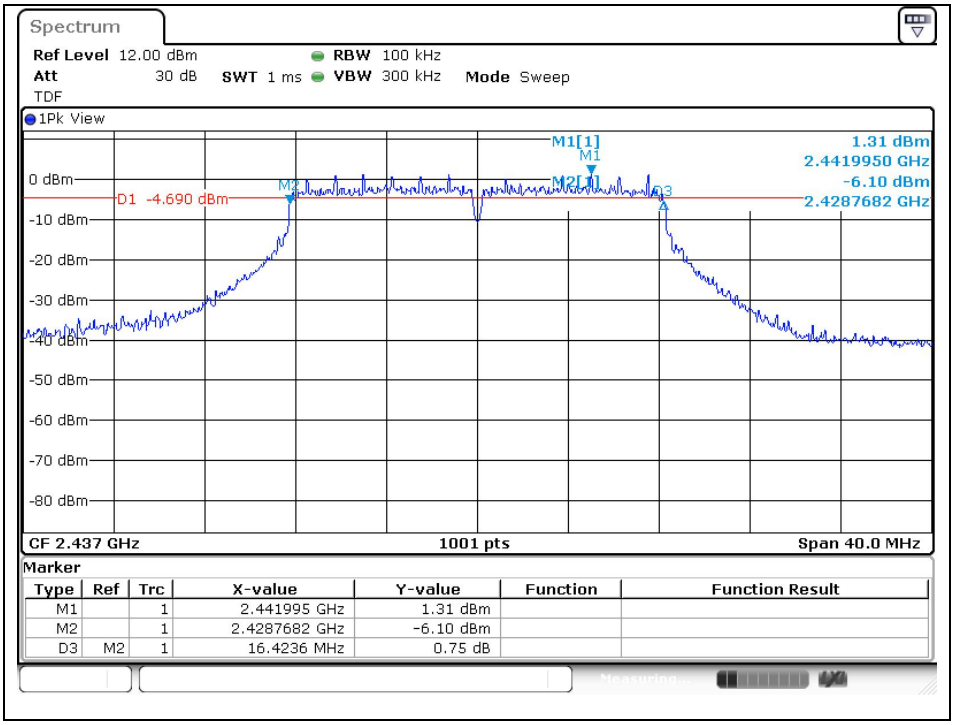


OFDM: 802.11g

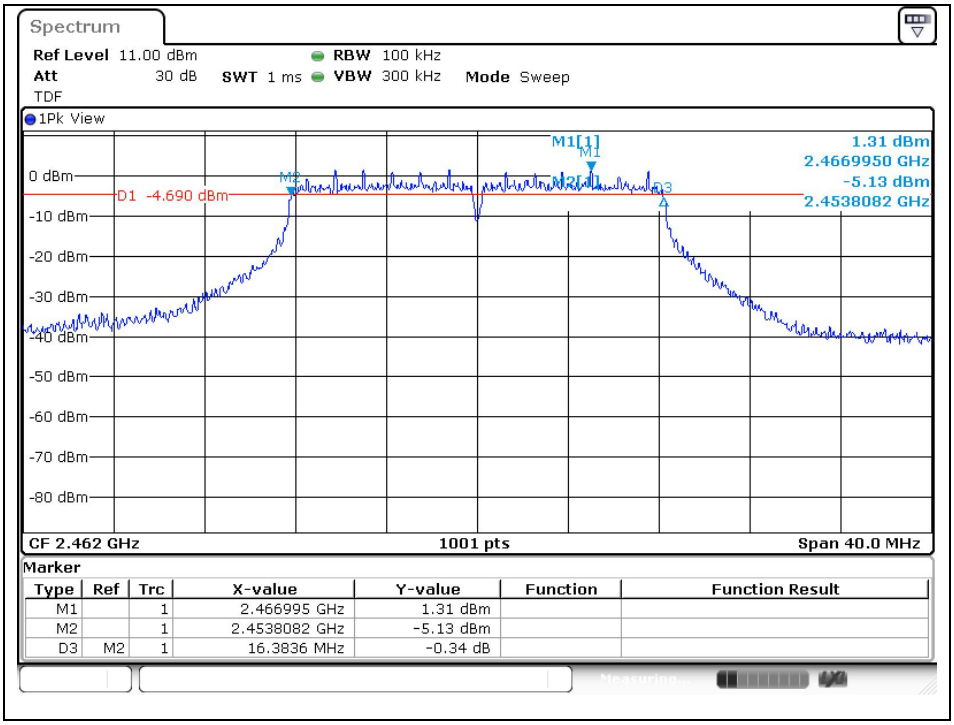
Low Channel



Middle Channel

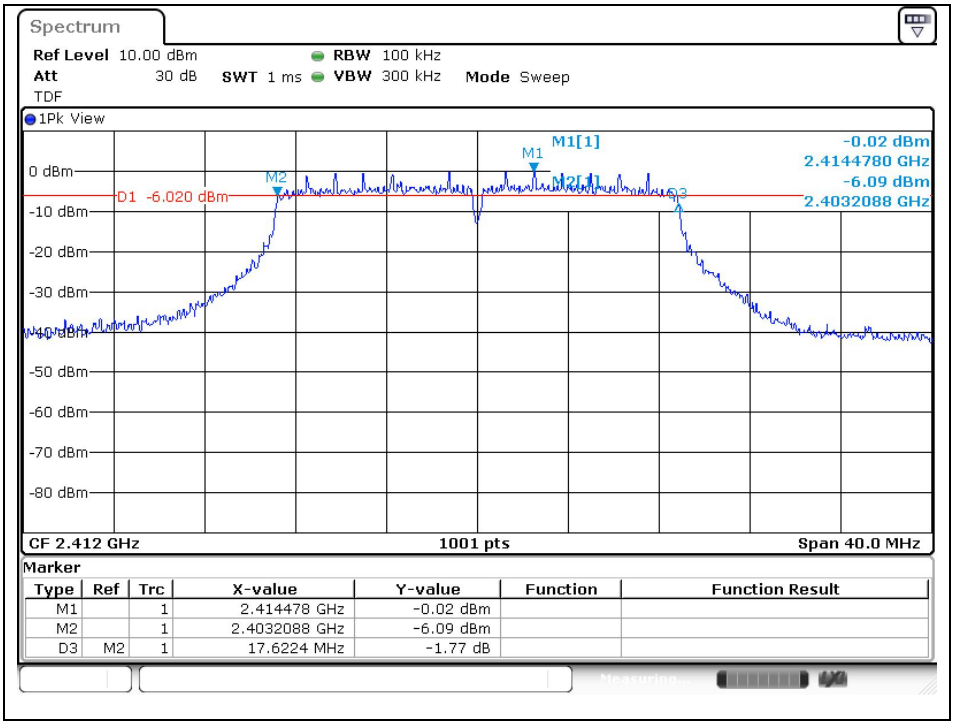


High Channel

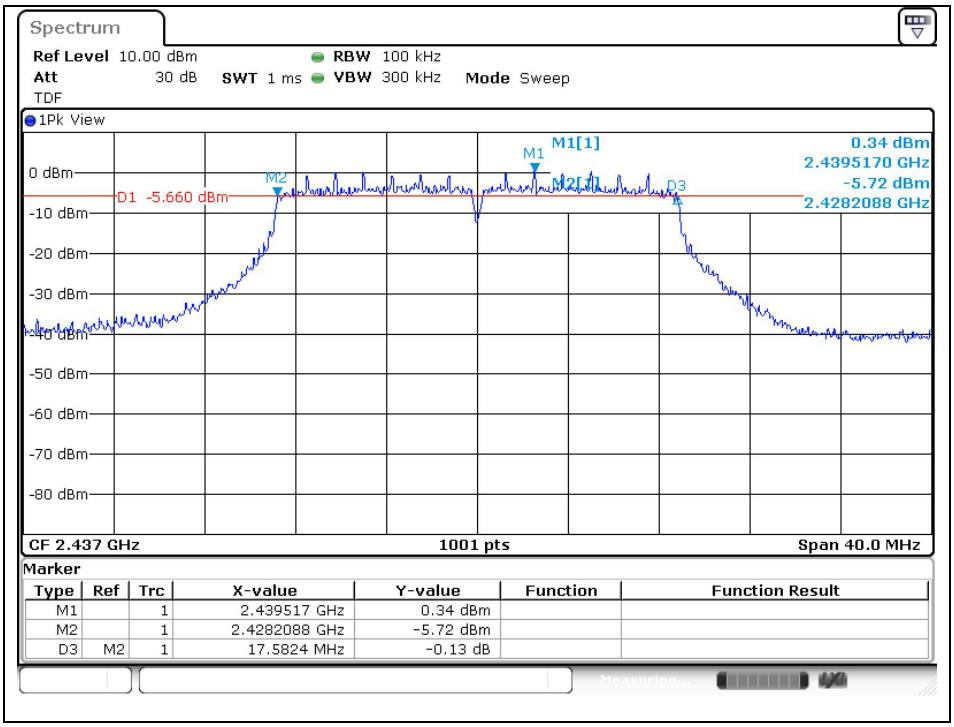


OFDM: 802.11n_HT20

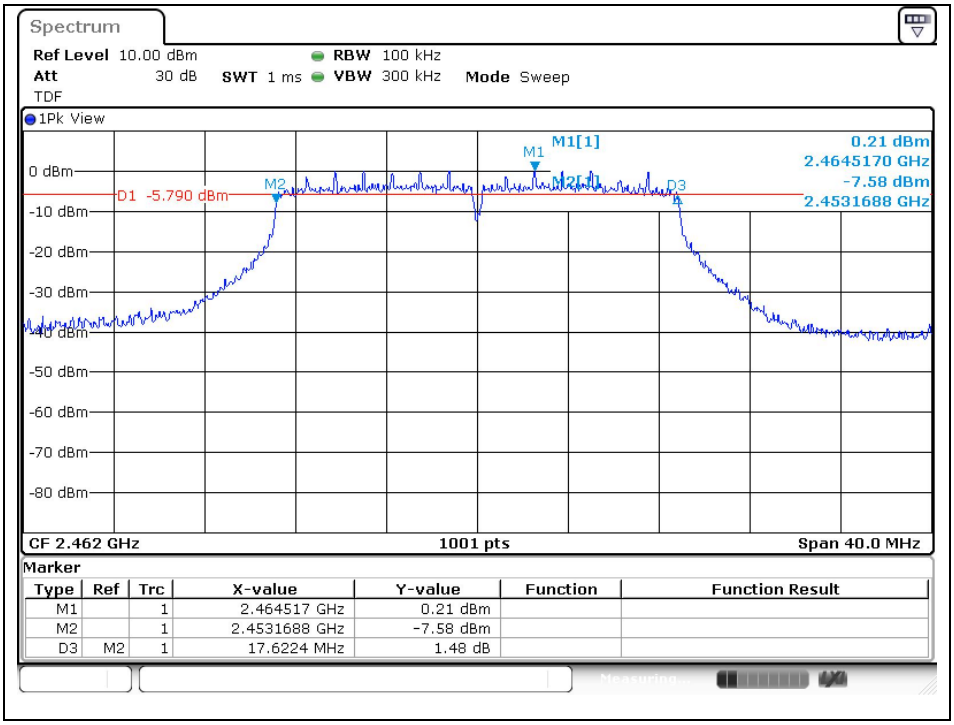
Low Channel



Middle Channel

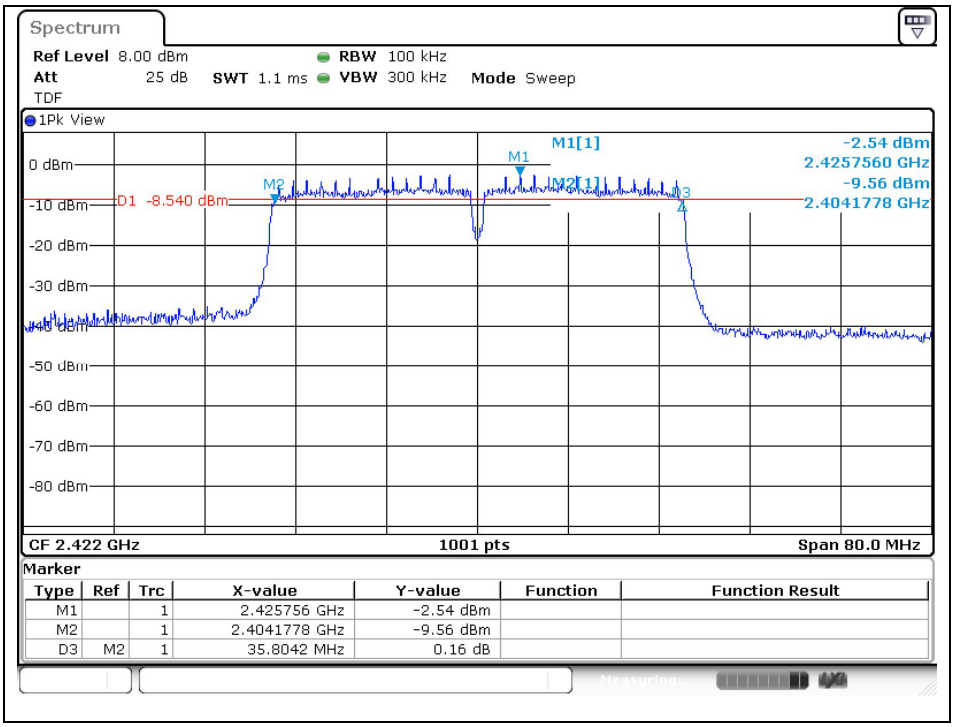


High Channel

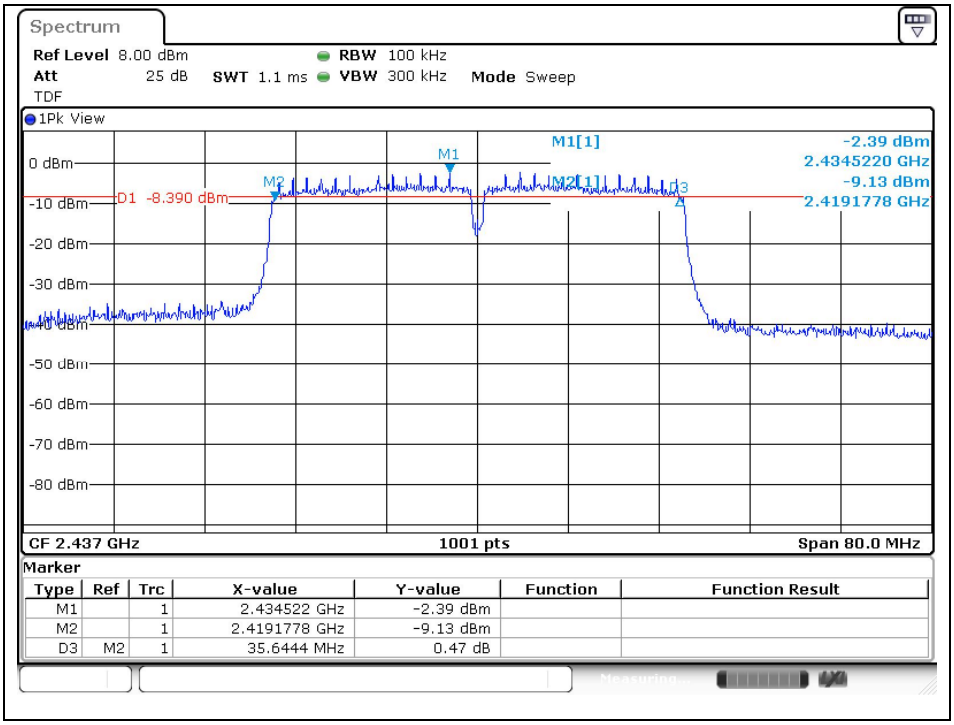


OFDM: 802.11n_HT40

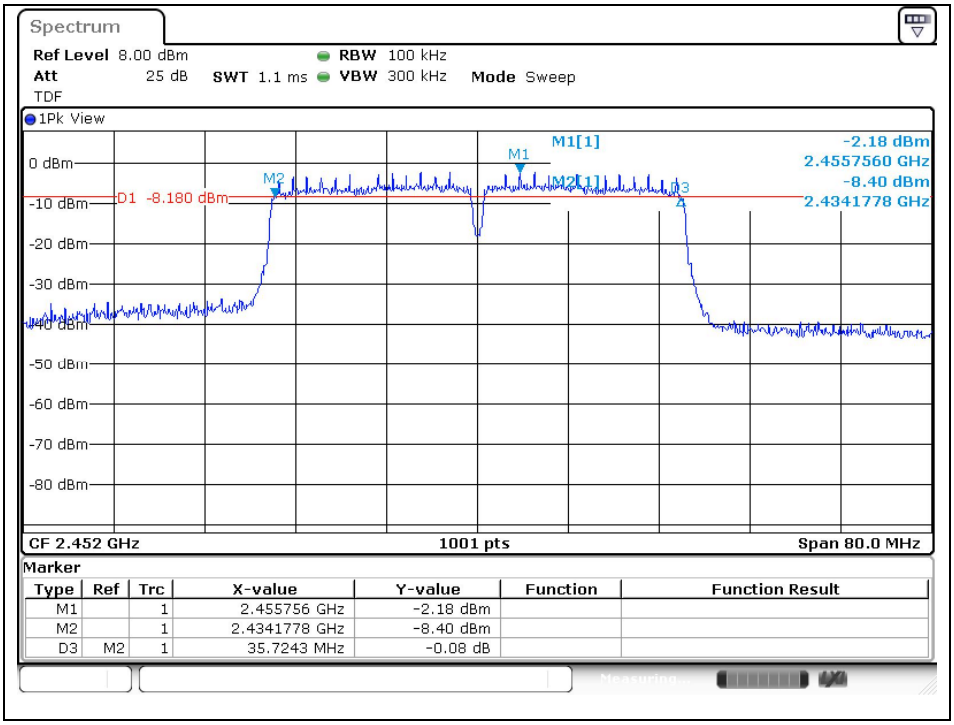
Low Channel



Middle Channel

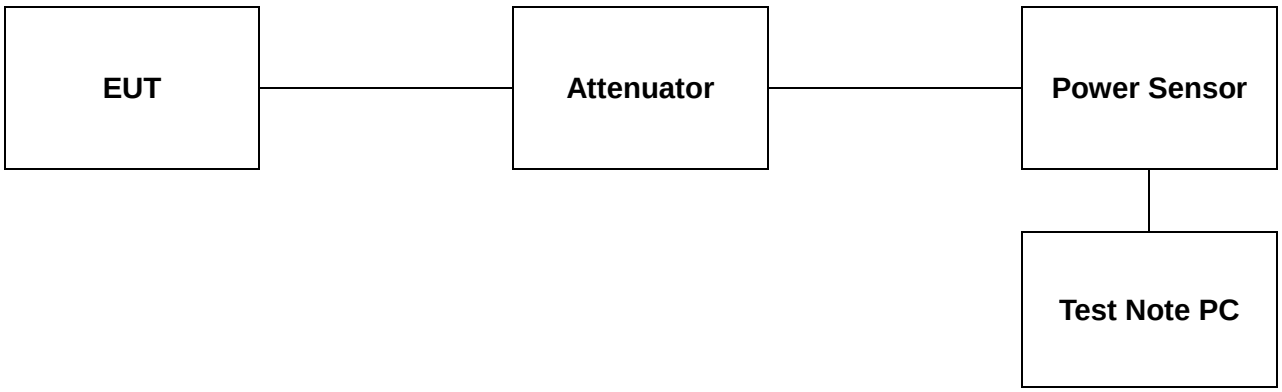


High Channel



4. Maximum Peak Conducted Output Power

4.1. Test Setup



4.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902-928 ㎒, 2 400-2 483.5 ㎒, and 5 725-5 850 ㎒ bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antenna with directional gains that do not exceed 6 ㏈i. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 ㏈i are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in ㏈ that the directional gain of the antenna exceeds 6 ㏈i.

4.3. Test Procedure

The test follows section 11.9.1.3 of ANSI C63.10-2013.

PKPM1 Peak-reading power meter method
- The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The test follows section 11.9.2.3.2 of ANSI C63.10-2013.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)
- Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Test program: (S/W name: R&S Power Viewer, Version: 3.2.0)

1. Initially overall offset for attenuator and cable loss is measured per frequency.
2. Measured offset is inserted in test program in advance of measurement for output power.
3. Power for each frequency (channel) of device is investigated as final result.
4. Final result reported on this section from R&S power viewer program includes with several factors and test program shows only final result.

4.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Test voltage: DC 12 V

Mode	Channel	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Peak Power Result (㏈m)	Limit (㏈m)
DSSS (802.11b)	Low	2 412	1	15.86	18.31	30
	Middle	2 437		16.21	18.66	
	High	2 462		**16.29**	**18.80**	
OFDM (802.11g)	Low	2 412	6	14.16	23.94	
	Middle	2 437		14.28	**24.66**	
	High	2 462		**14.44**	24.35	
OFDM (802.11n_HT20)	Low	2 412	MCS0	13.00	**23.40**	
	Middle	2 437		13.35	23.34	
	High	2 462		**13.48**	23.30	
OFDM (802.11n_HT40)	Low	2 422	MCS0	12.72	22.86	
	Middle	2 437		**13.30**	**24.28**	
	High	2 452		13.28	23.47	

Test voltage: DC 24 V

Mode	Channel	Frequency (㎒)	Data Rate (Mbps)	Average Power Result (㏈m)	Peak Power Result (㏈m)	Limit (㏈m)
DSSS (802.11b)	Low	2 412	1	16.00	18.30	30
	Middle	2 437		16.21	18.54	
	High	2 462		**16.38**	**18.70**	
OFDM (802.11g)	Low	2 412	6	14.22	24.05	
	Middle	2 437		14.52	24.63	
	High	2 462		**14.59**	**24.64**	
OFDM (802.11n_HT20)	Low	2 412	MCS0	13.24	23.23	
	Middle	2 437		13.63	**23.97**	
	High	2 462		**13.71**	23.88	
OFDM (802.11n_HT40)	Low	2 422	MCS0	13.15	23.49	
	Middle	2 437		13.33	23.63	
	High	2 452		**13.40**	**23.63**	

Remark;

Attenuator and cable offset was compensated in test program (R&S Power Viewer) before measuring.

5. Power Spectral Density

5.1. Test Setup

5.2. Limit

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 ㎑ band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.3. Test Procedure

The measurements are recorded using the PKPSD measurement procedure in section 11.10.2 of ANSI C63.10-2013.

- This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 x DTS bandwidth.
3. Set the RBW to: 3 ㎑ ≤ RBW ≤ 100 ㎑.
4. Set the VBW ≥ 3 x RBW.
5. Detector = Peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 ㎑) and repeat.

5.4. Test Results

Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Test voltage: DC 12 V

Operation Mode	Data Rate (Mbps)	Channel	Frequency (㎒)	Measured PSD (㏈m)	Limit (㏈m)
DSSS (802.11b)	1	Low	2 412	-7.57	8
		Middle	2 437	-7.54	
		High	2 462	-8.00	
OFDM (802.11g)	6	Low	2 412	-11.75	
		Middle	2 437	-12.21	
		High	2 462	-11.50	
OFDM (802.11n_HT20)	MCS0	Low	2 412	-14.35	
		Middle	2 437	-12.00	
		High	2 462	-13.41	
OFDM (802.11n_HT40)	MCS0	Low	2 422	-15.96	
		Middle	2 437	-17.15	
		High	2 452	-17.90	

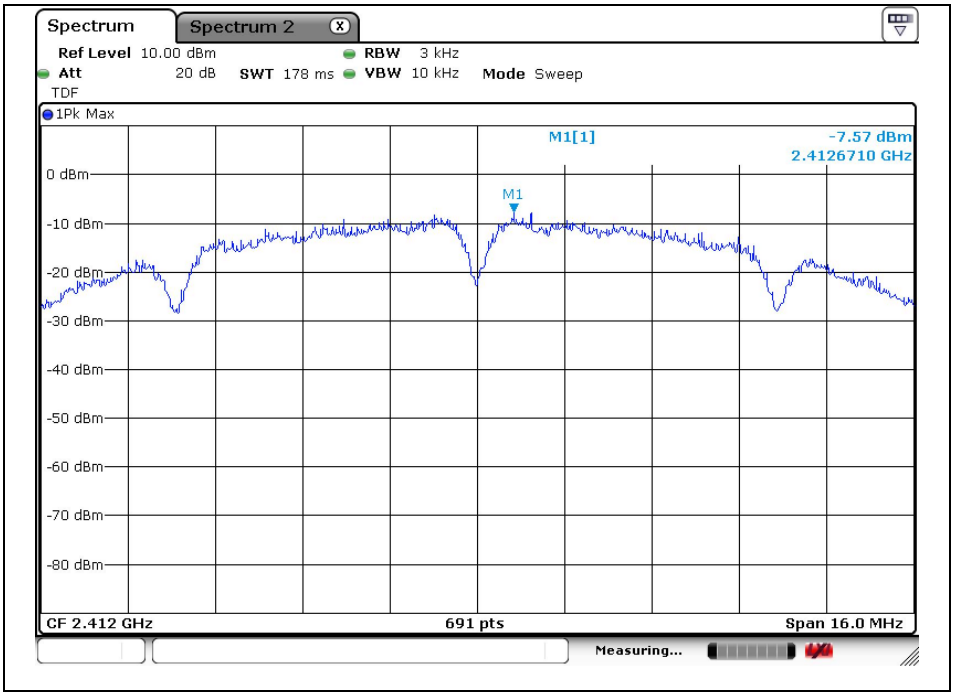
Test voltage: DC 24 V

Operation Mode	Data Rate (Mbps)	Channel	Frequency (㎒)	Measured PSD (㏈ m)	Limit (㏈ m)
DSSS (802.11b)	1	Low	2 412	-8.05	8
		Middle	2 437	-6.89	
		High	2 462	-7.54	
OFDM (802.11g)	6	Low	2 412	-11.60	
		Middle	2 437	-12.20	
		High	2 462	-12.12	
OFDM (802.11n_HT20)	MCS0	Low	2 412	-13.90	
		Middle	2 437	-13.30	
		High	2 462	-14.64	
OFDM (802.11n_HT40)	MCS0	Low	2 422	-15.91	
		Middle	2 437	-15.78	
		High	2 452	-16.11	

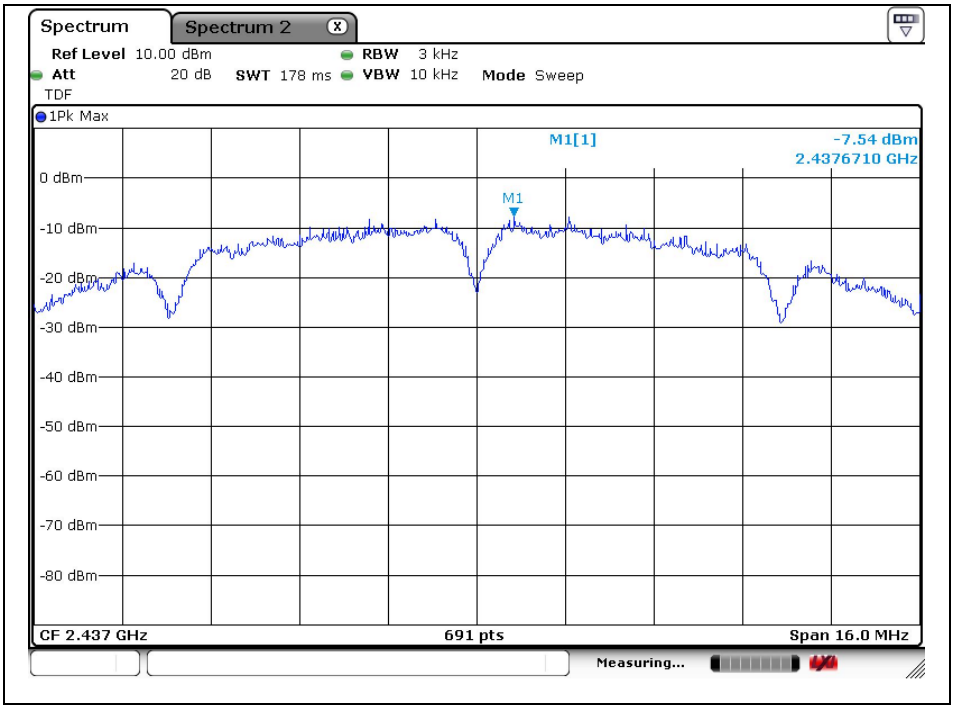
- Test plots

Test voltage: DV 12 V

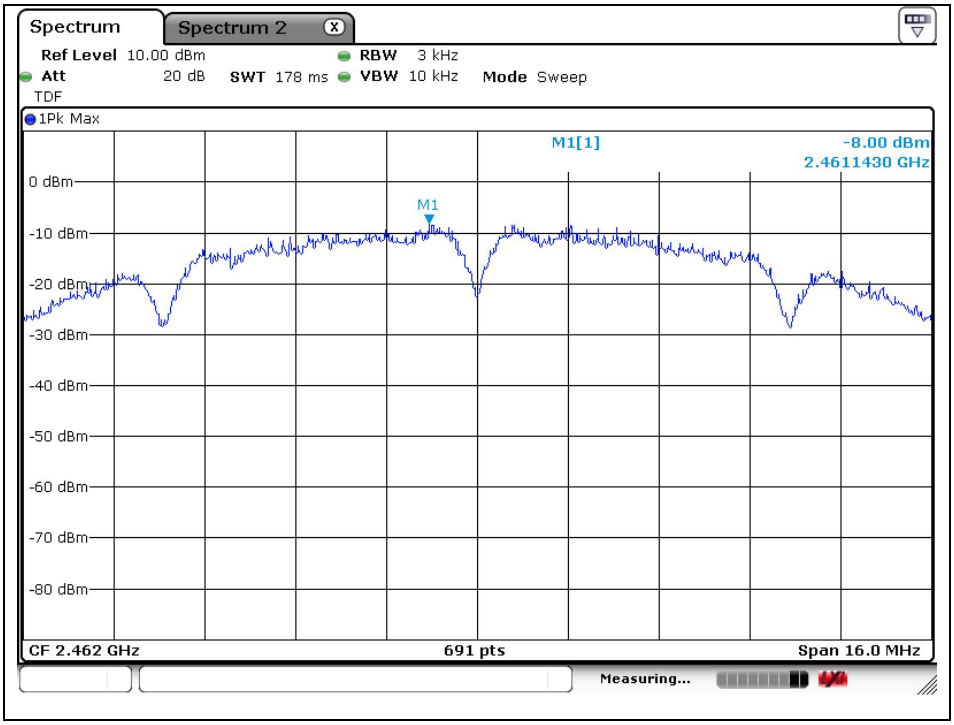
DSSS: 802.11b
Low Channel



Middle Channel

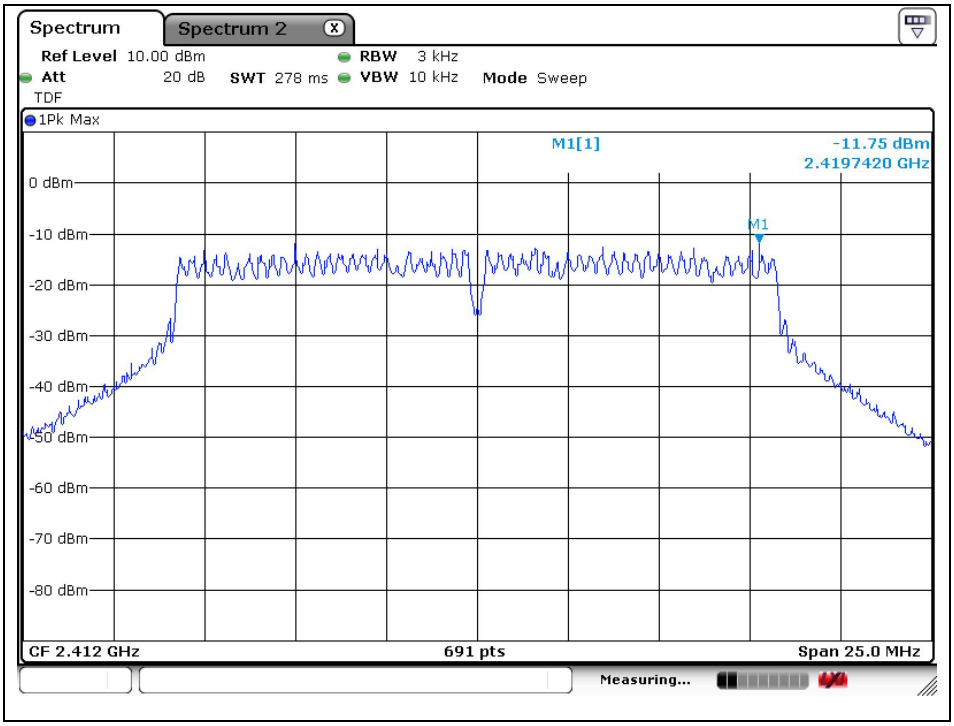


High Channel

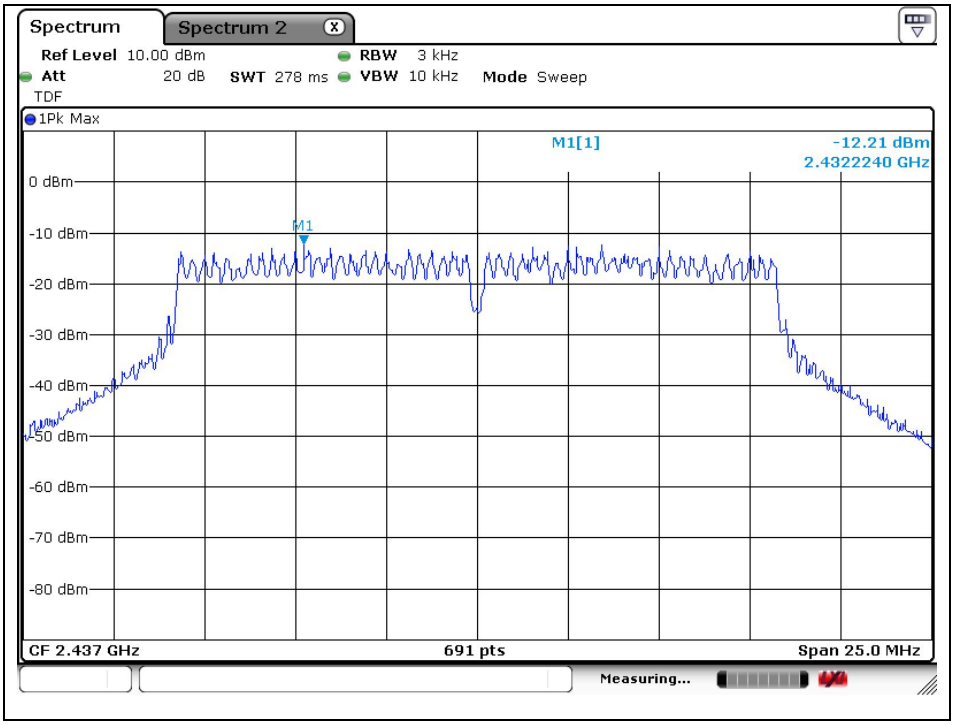


OFDM: 802.11g

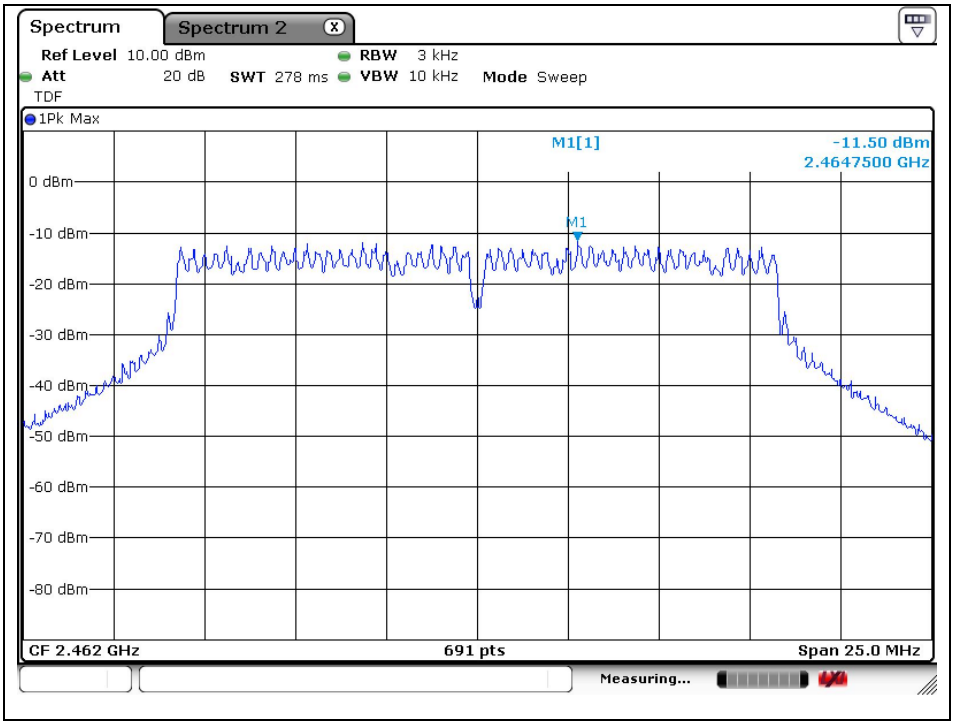
Low Channel



Middle Channel

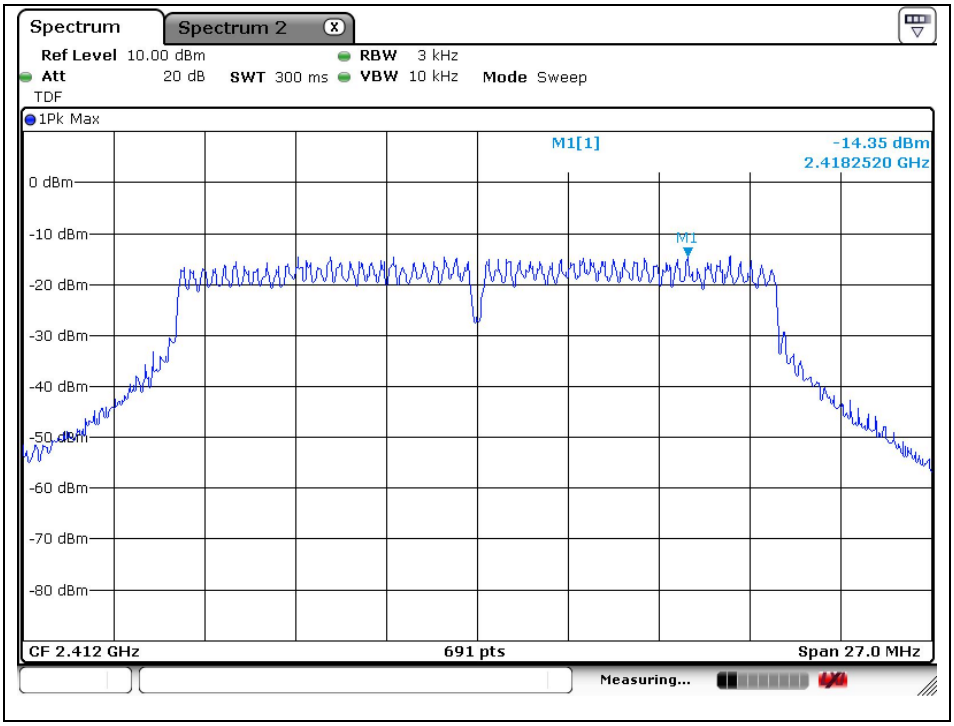


High Channel

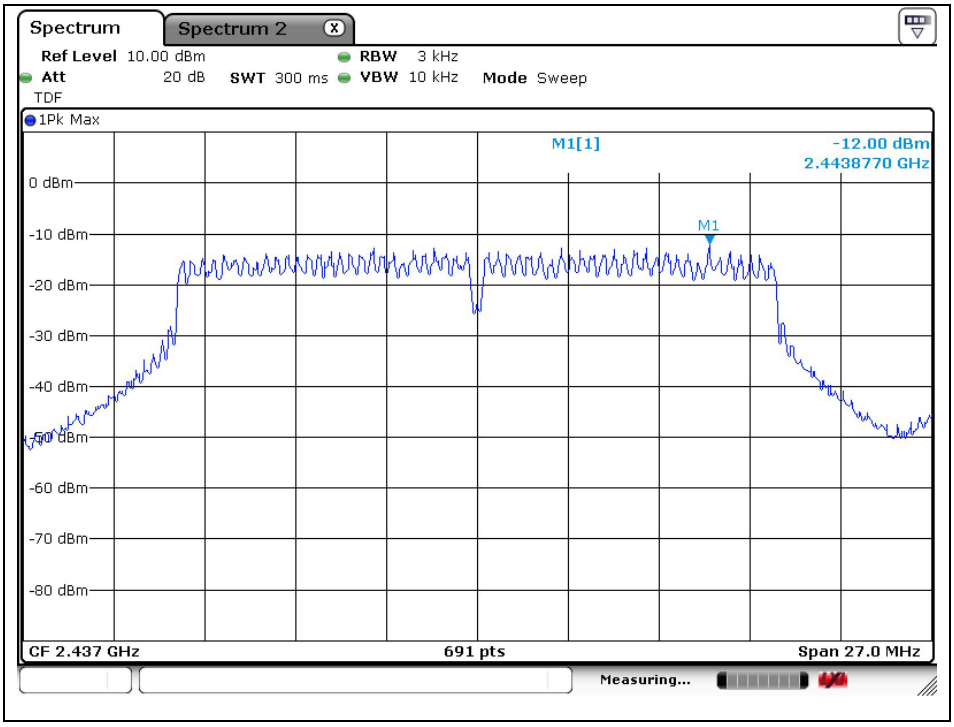


OFDM: 802.11n_HT20

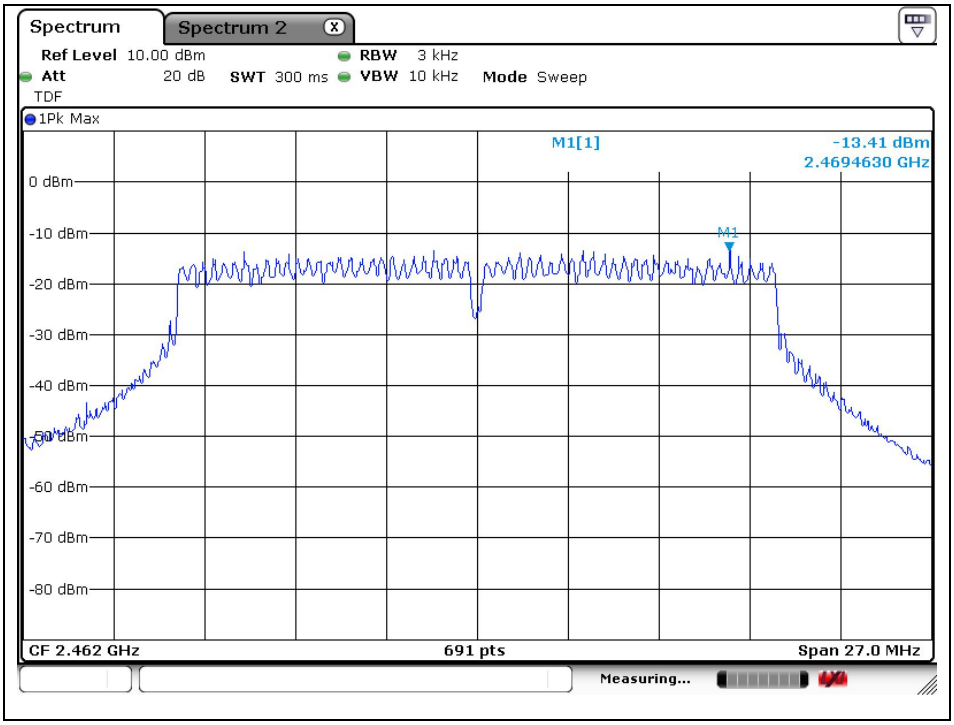
Low Channel



Middle Channel

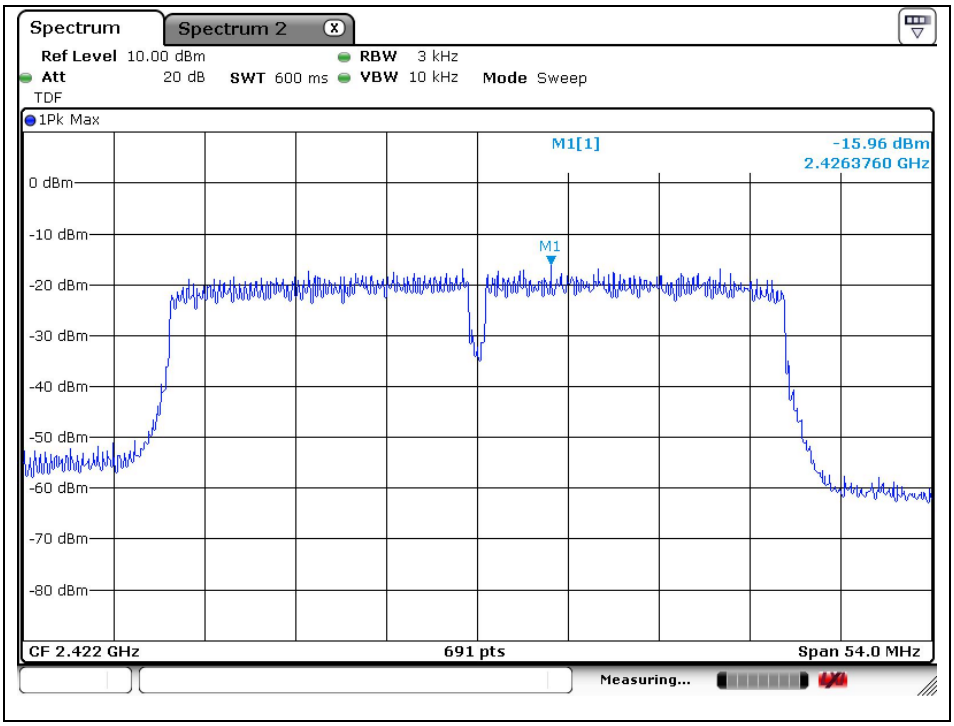


High Channel

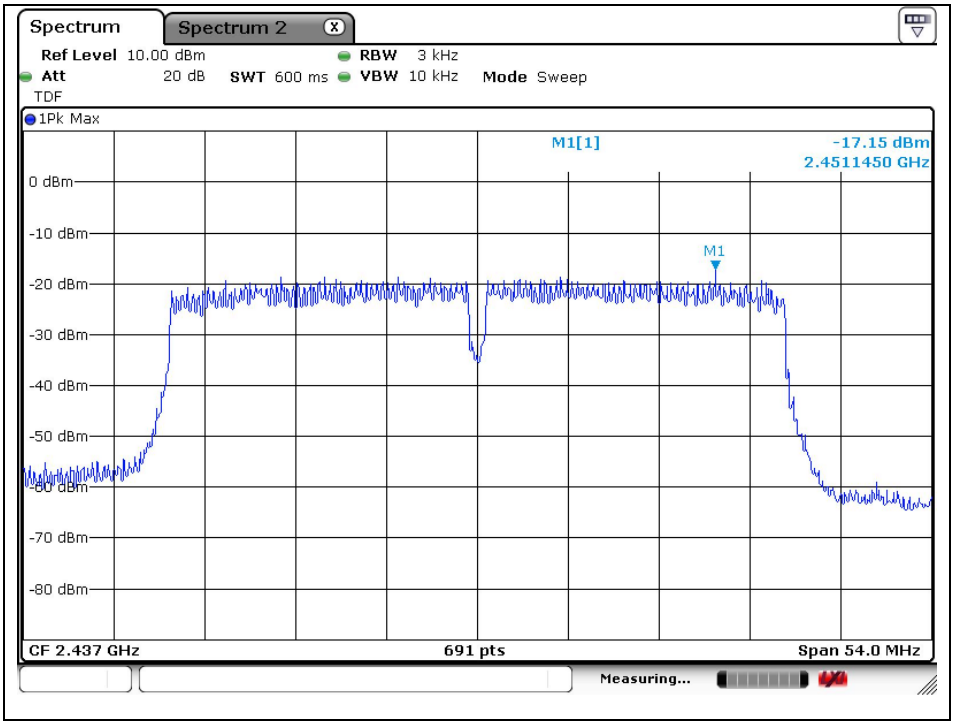


OFDM: 802.11n_HT20

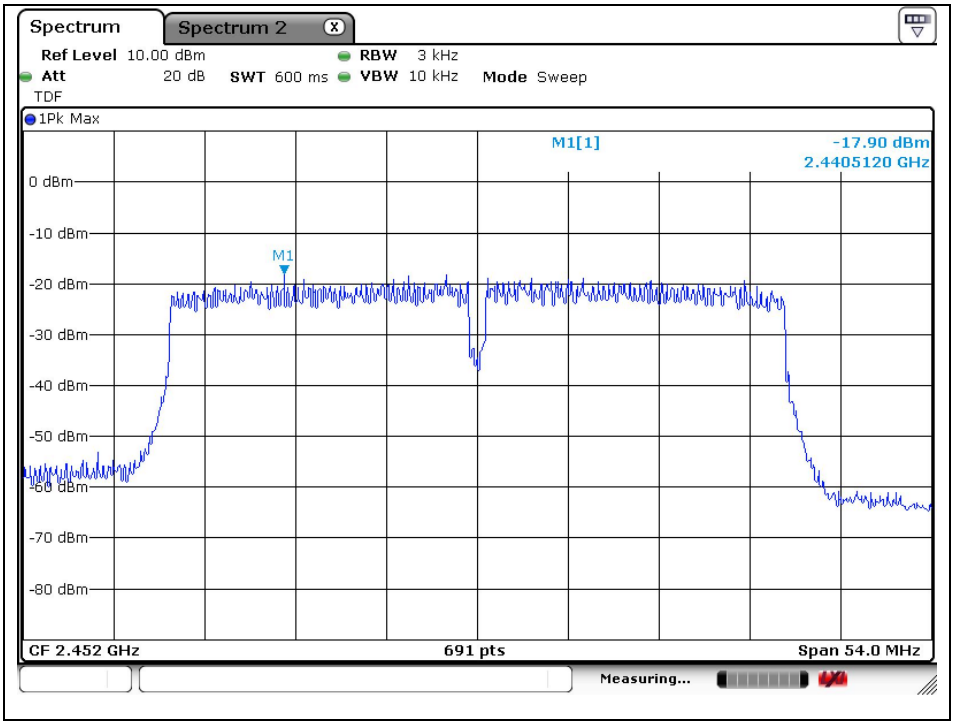
Low Channel



Middle Channel



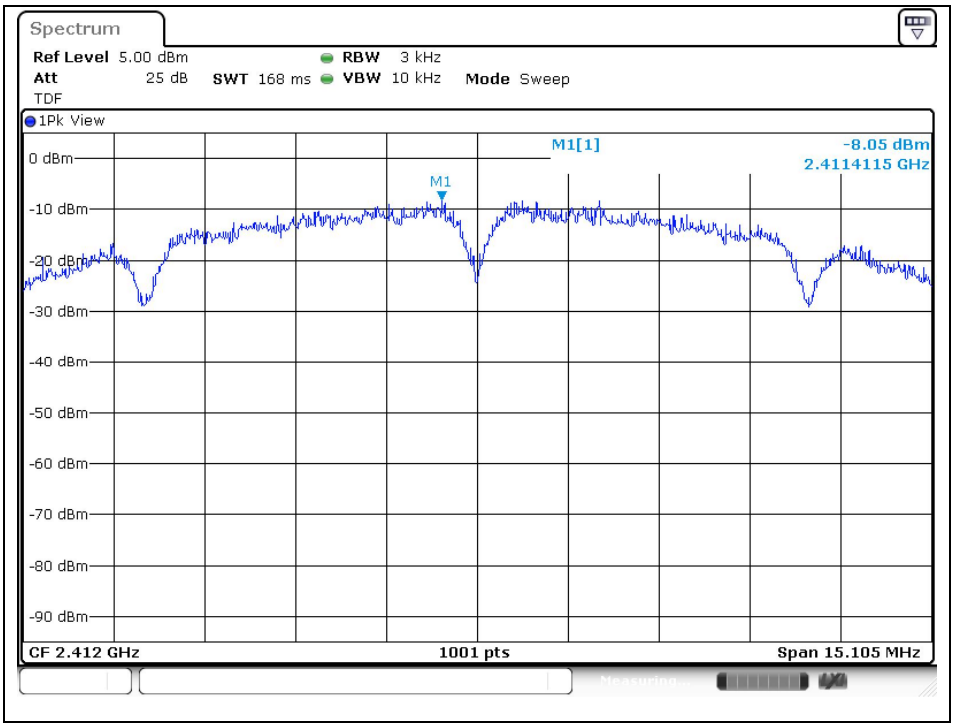
High Channel



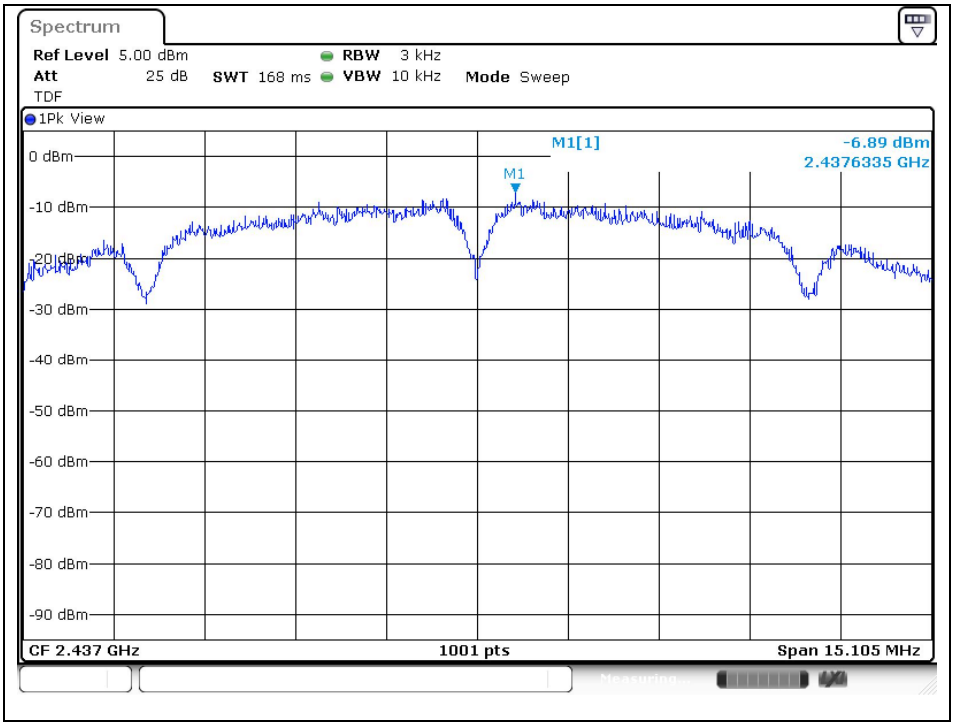
Test voltage: DV 24 V

DSSS: 802.11b

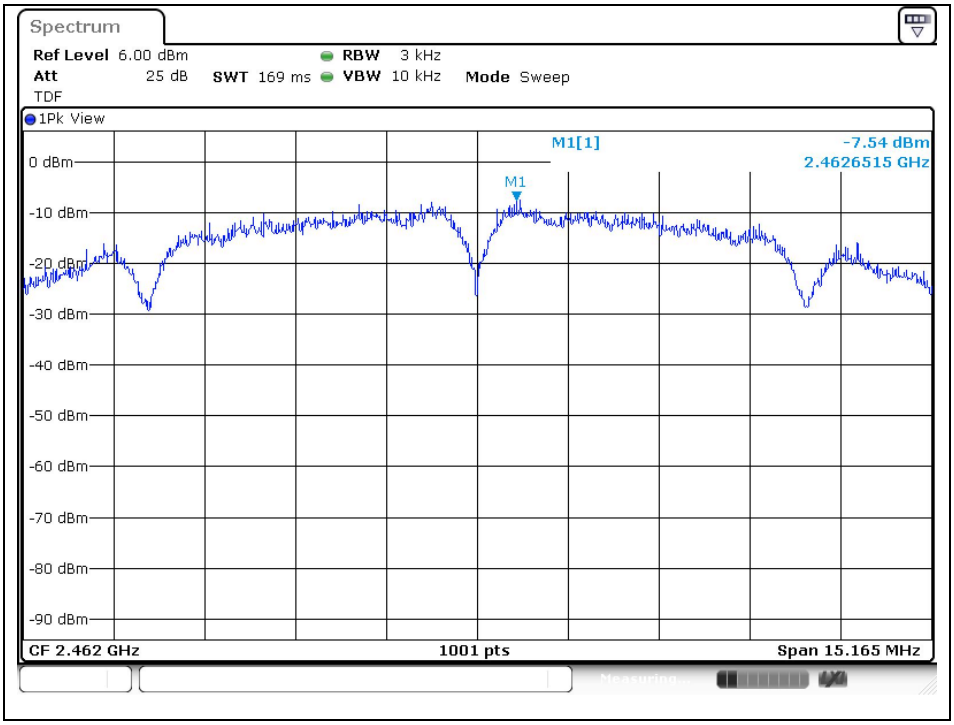
Low Channel



Middle Channel

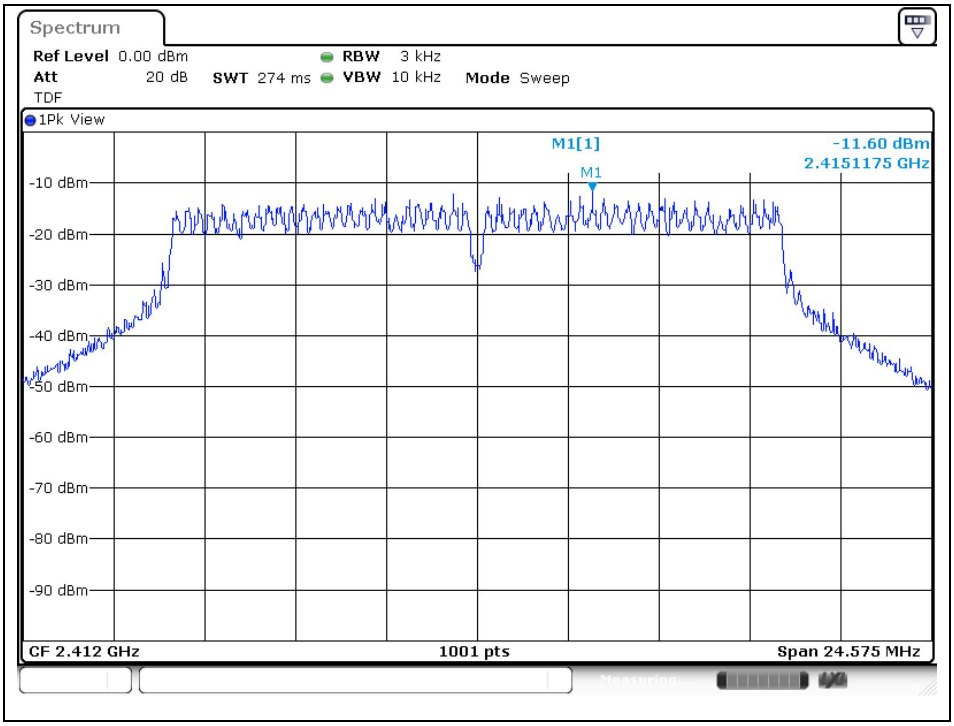


High Channel

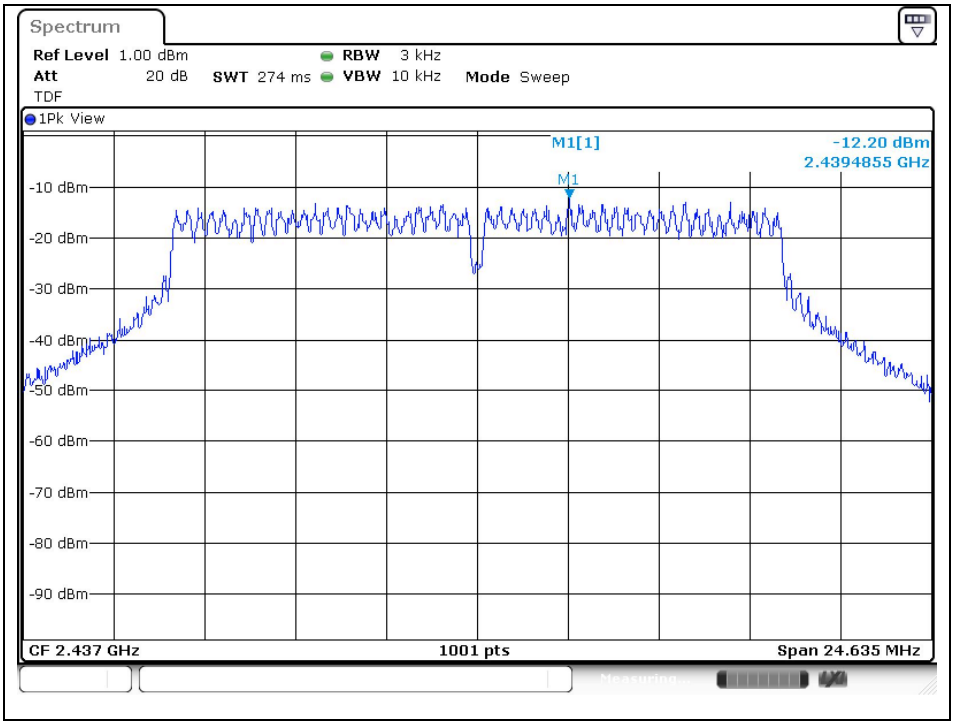


OFDM: 802.11g

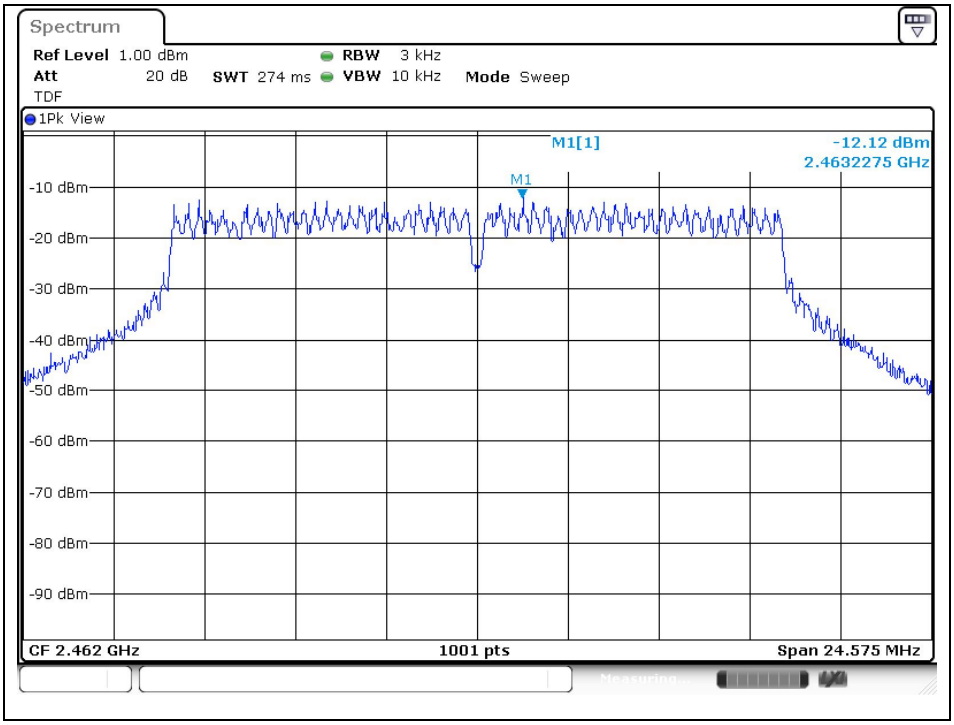
Low Channel



Middle Channel

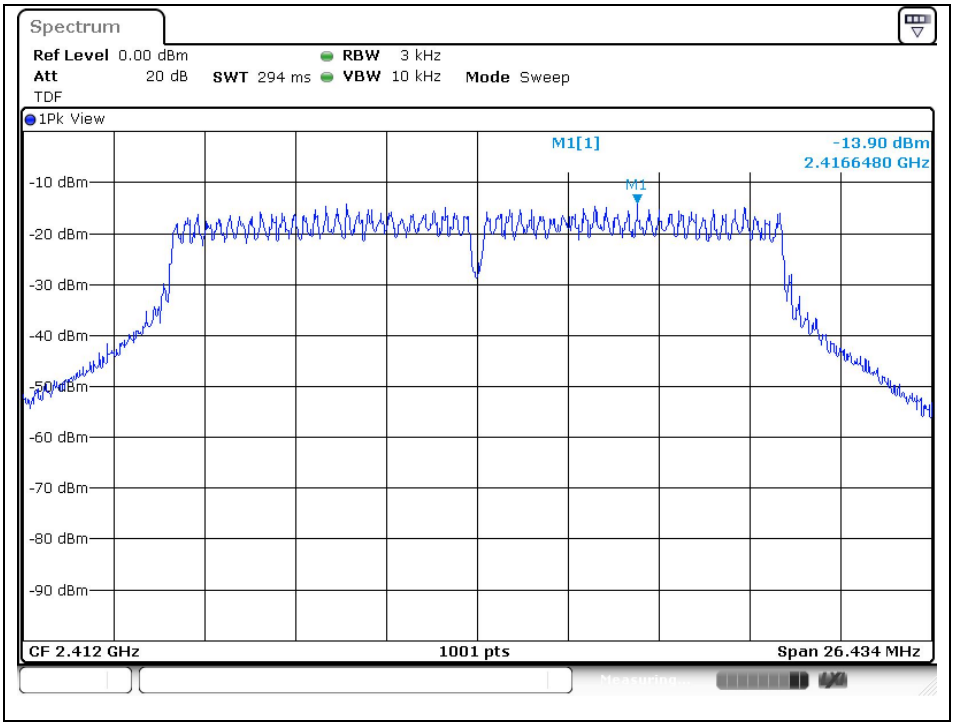


High Channel

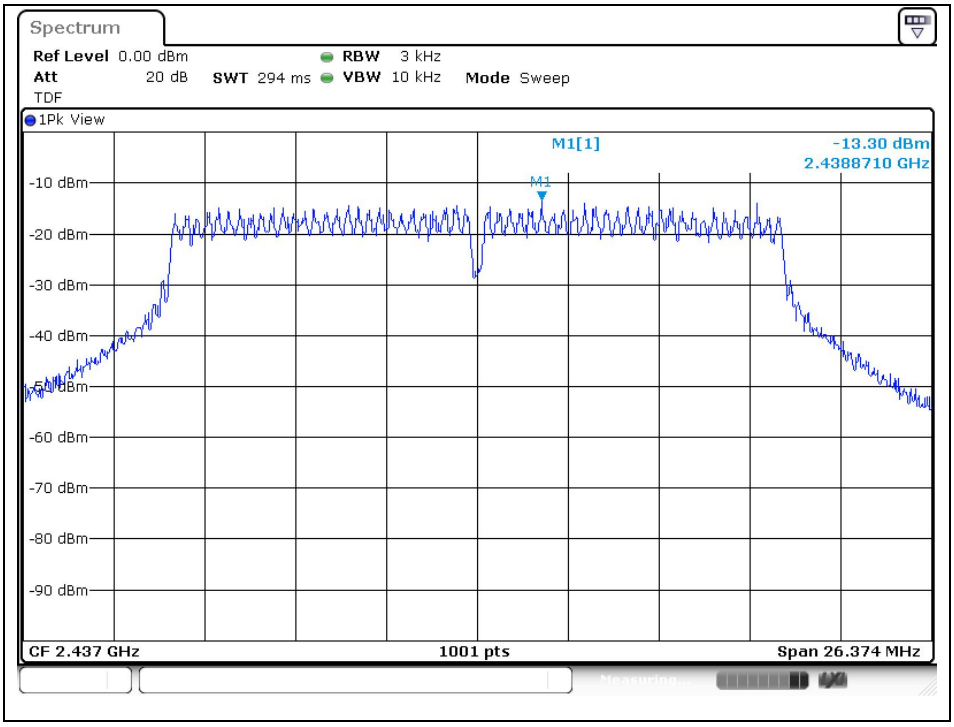


OFDM: 802.11n_HT20

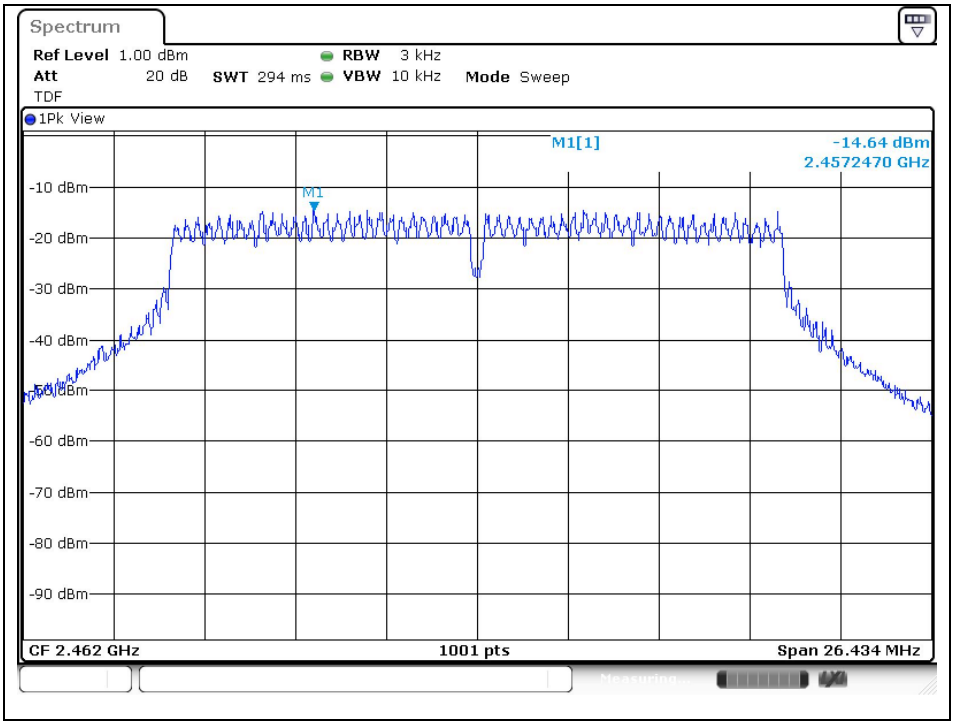
Low Channel



Middle Channel

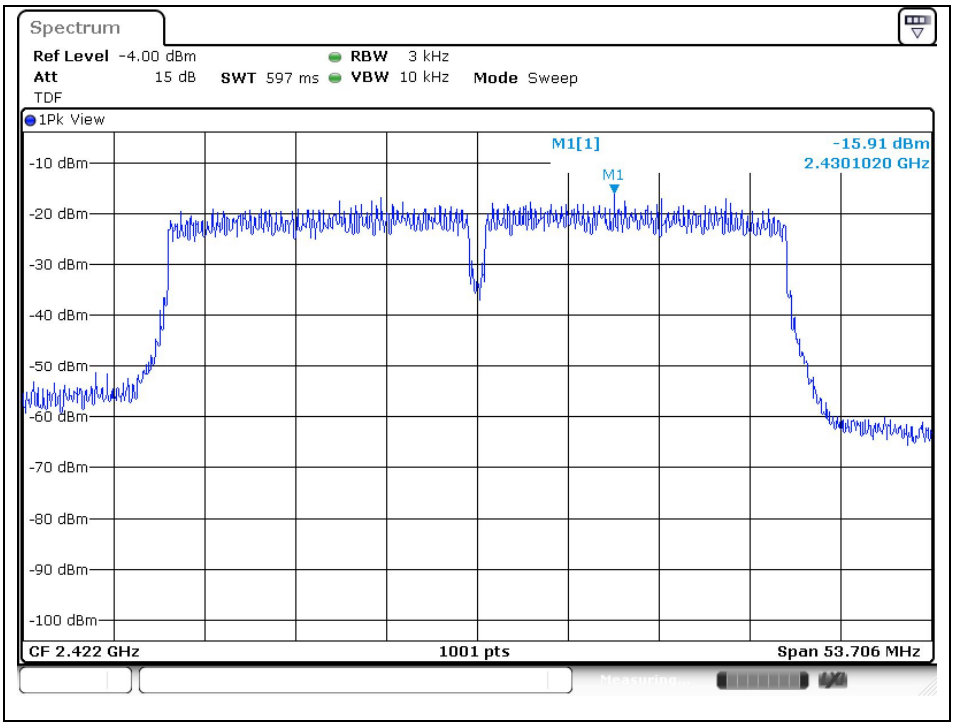


High Channel

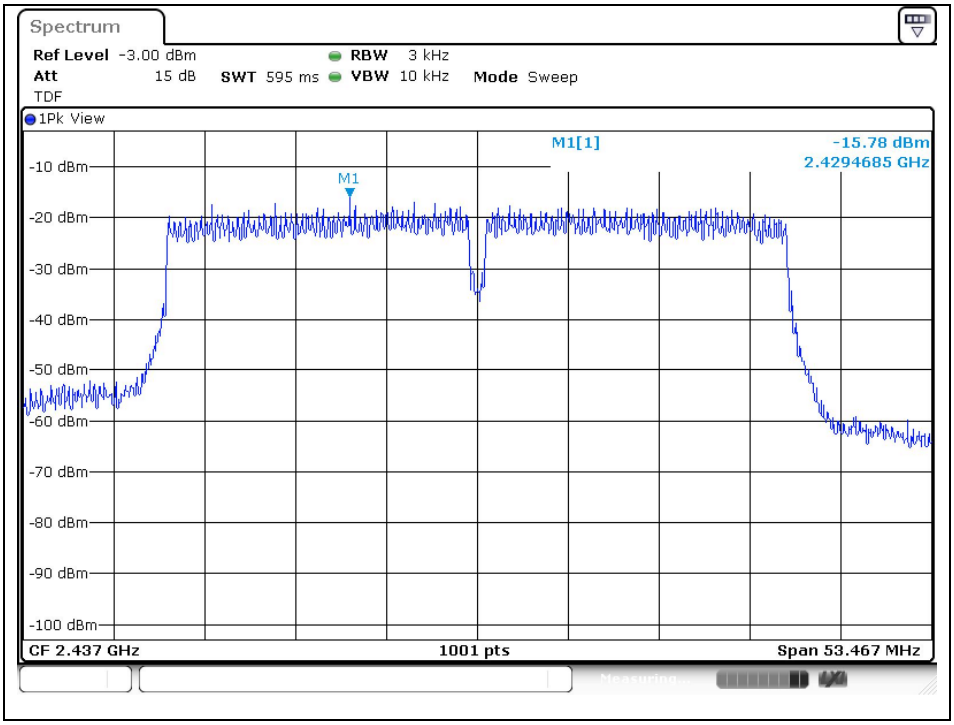


OFDM: 802.11n_HT40

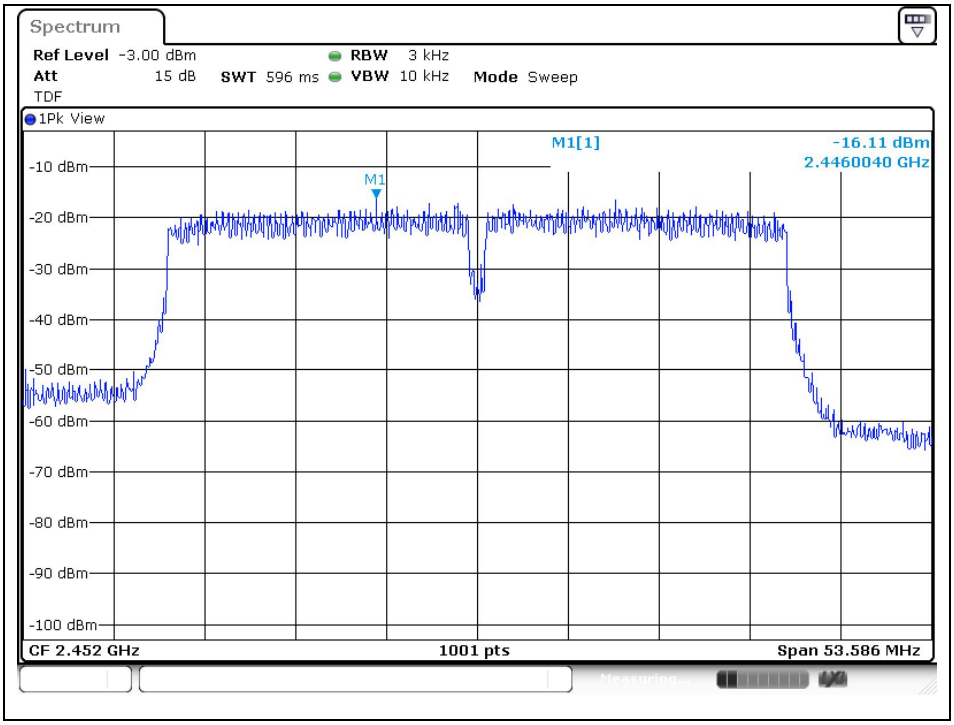
Low Channel



Middle Channel



High Channel



6. Antenna Requirement

6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section §15.247 (b) if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

6.2. Antenna Connected Construction

Antenna used in this product is Multilayer Chip Antenna with gain of 3.50 dBi.

- End of the Test Report -