

### 3. 6 dB Bandwidth & 99 % Bandwidth

#### 3.1. Test Setup



#### 3.2. Limit

##### 3.2.1. FCC

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

##### 3.2.2. IC

According to RSS-247 Issue 2, 5.2(a), the minimum 6 dB bandwidth shall be 500 kHz.

#### 3.3. Test Procedure

##### 3.3.1. 6 dB Bandwidth

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 kHz.
2. Set the VBW  $\geq [3 \times \text{RBW}]$ .
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 dB relative to the maximum level measured in the fundamental emission.

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A4(210 mm x 297 mm)

### 3.3.2. 99 % Bandwidth

- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

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### 3.4. Test Results

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

Operation Mode	Data Rate	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		99 % Bandwidth (MHz)	
				DC 5 V	DC 12 V	DC 5 V	DC 12 V
DSSS (802.11b)	1 Mbps	Low	2 412	9.117	9.045	13.748	13.748
		Middle	2 437	9.117	9.117	13.748	13.748
		High	2 462	9.045	9.045	13.748	13.748
OFDM (802.11g)	6 Mbps	Low	2 412	16.498	16.498	17.438	17.438
		Middle	2 437	16.425	16.425	17.511	17.511
		High	2 462	16.425	16.498	17.511	17.438
OFDM (802.11n_HT20)	MCS0	Low	2 412	17.583	17.583	18.162	18.234
		Middle	2 437	17.583	17.511	18.234	18.234
		High	2 462	17.583	17.511	18.234	18.234
OFDM (802.11n_HT40)	MCS0	Low	2 422	35.310	35.460	36.324	36.324
		Middle	2 437	35.460	35.600	36.179	36.324
		High	2 452	35.310	35.600	36.324	36.324

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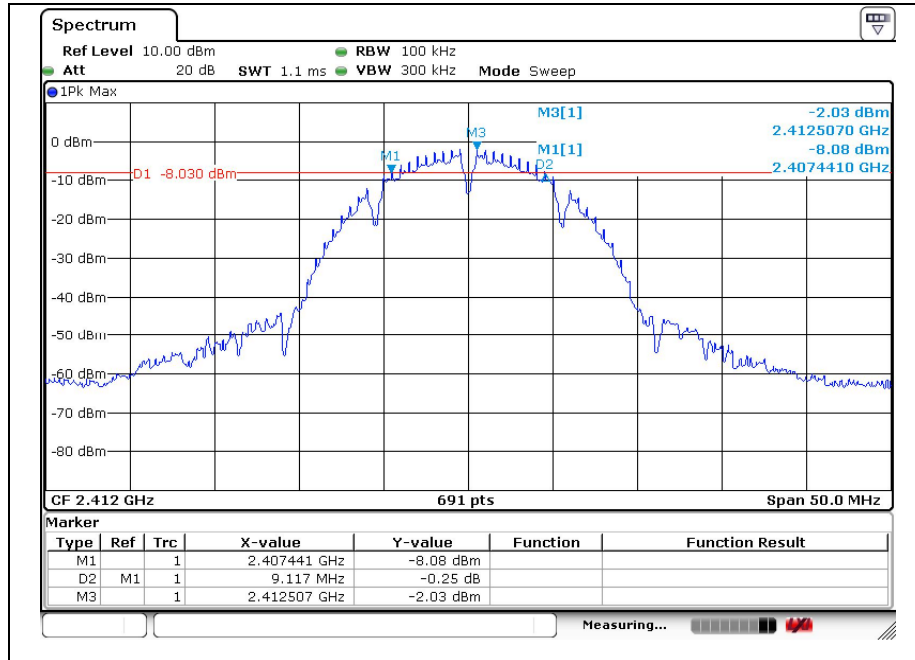
## - Test plots

6 dB Bandwidth

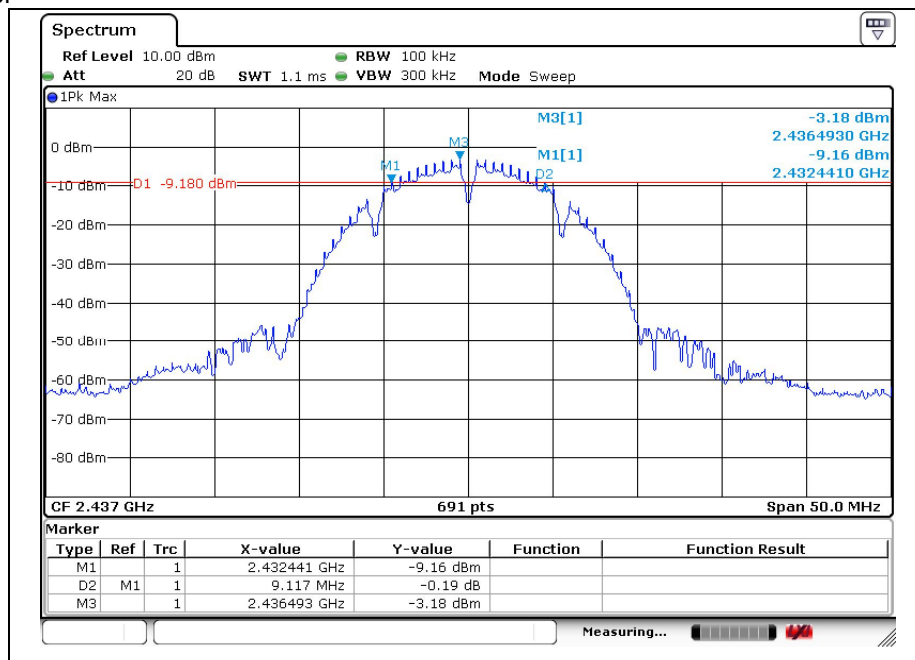
Test Condition: DC 5 V

DSSS: 802.11b

Low Channel



Middle Channel



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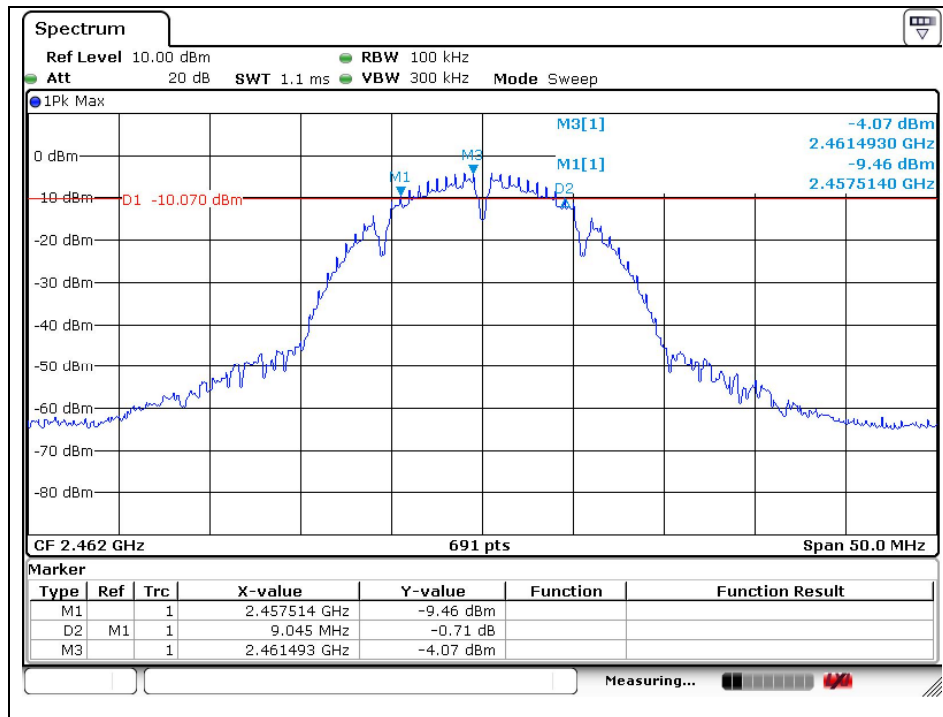
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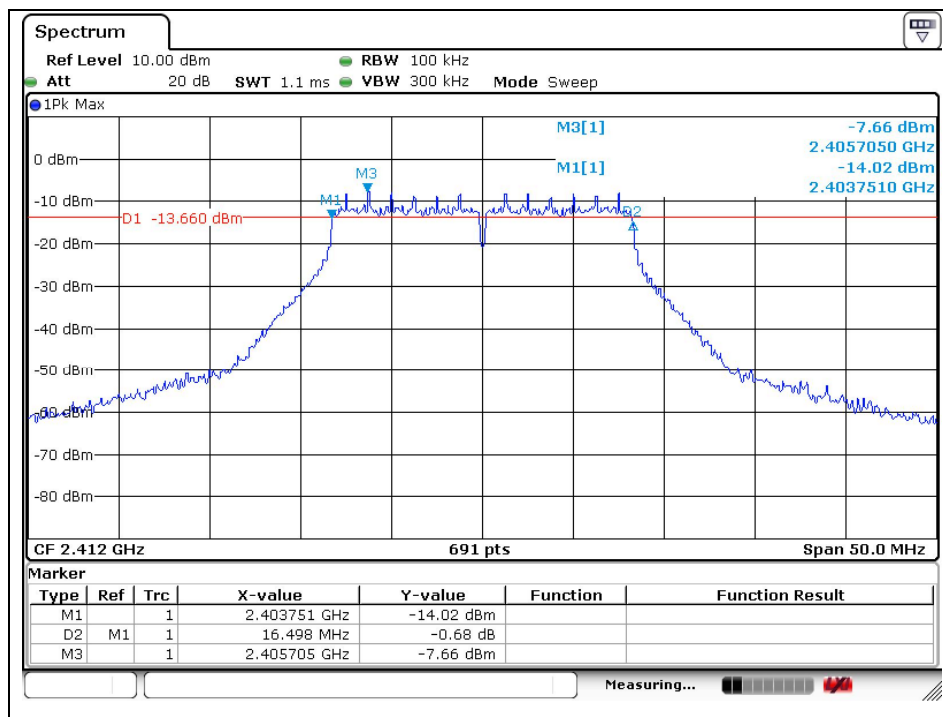
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11g

## Low Channel



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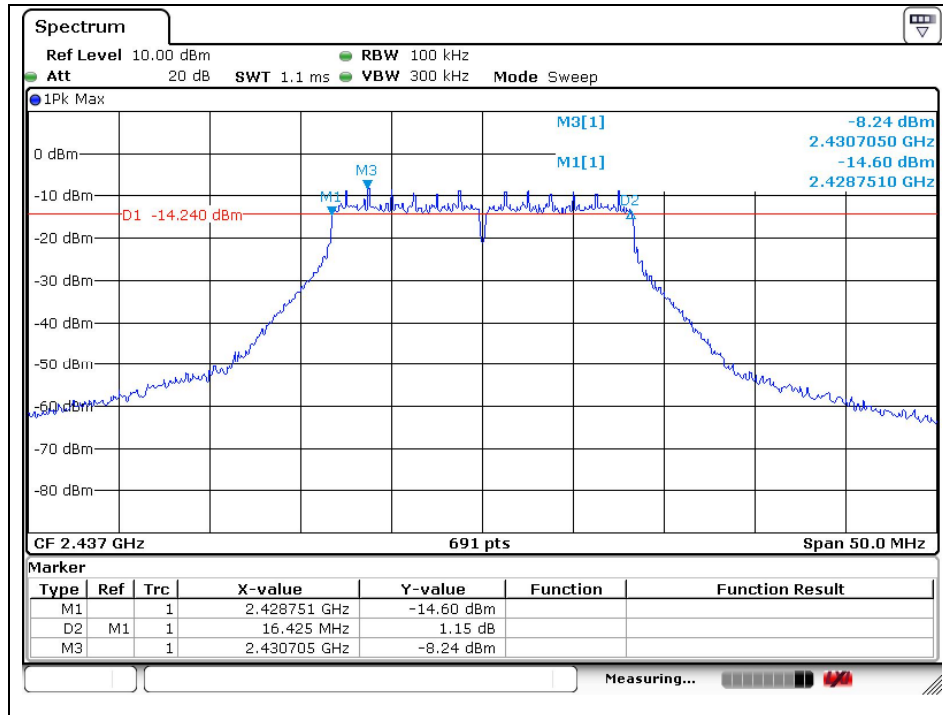
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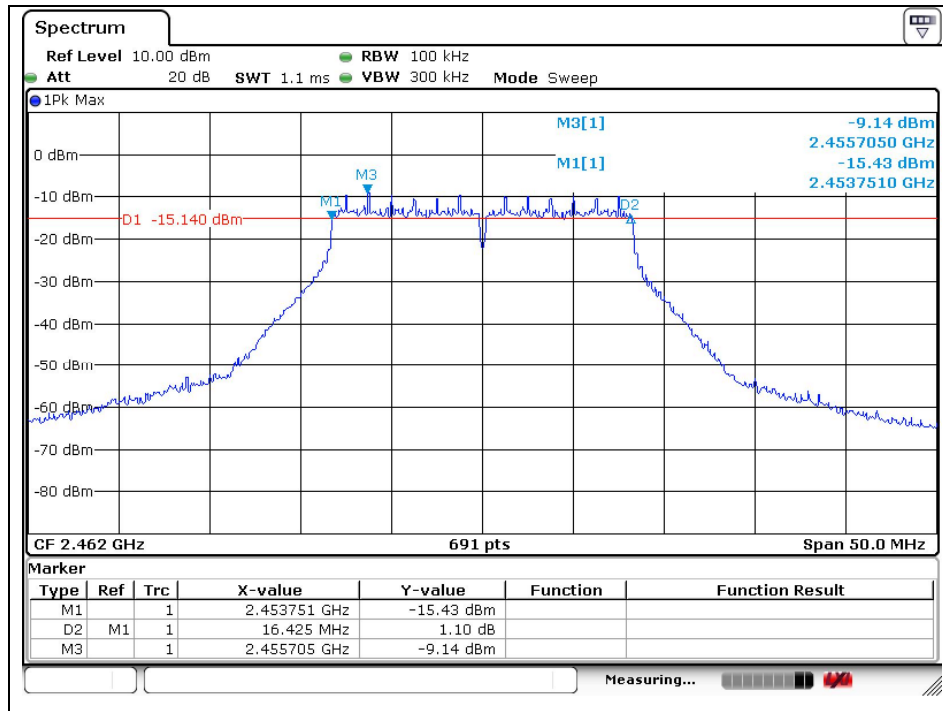
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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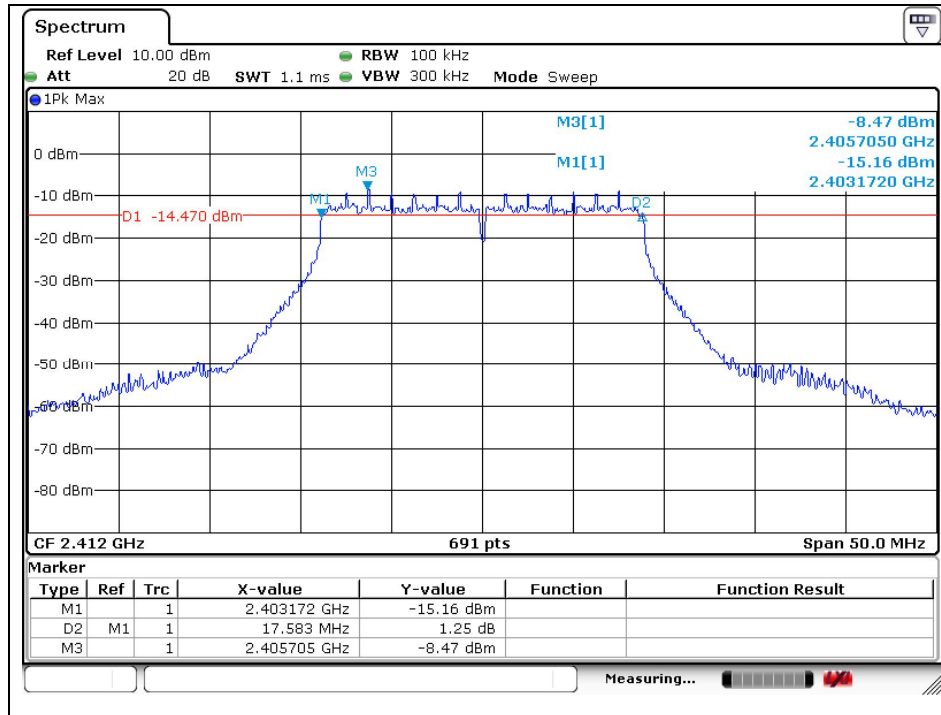
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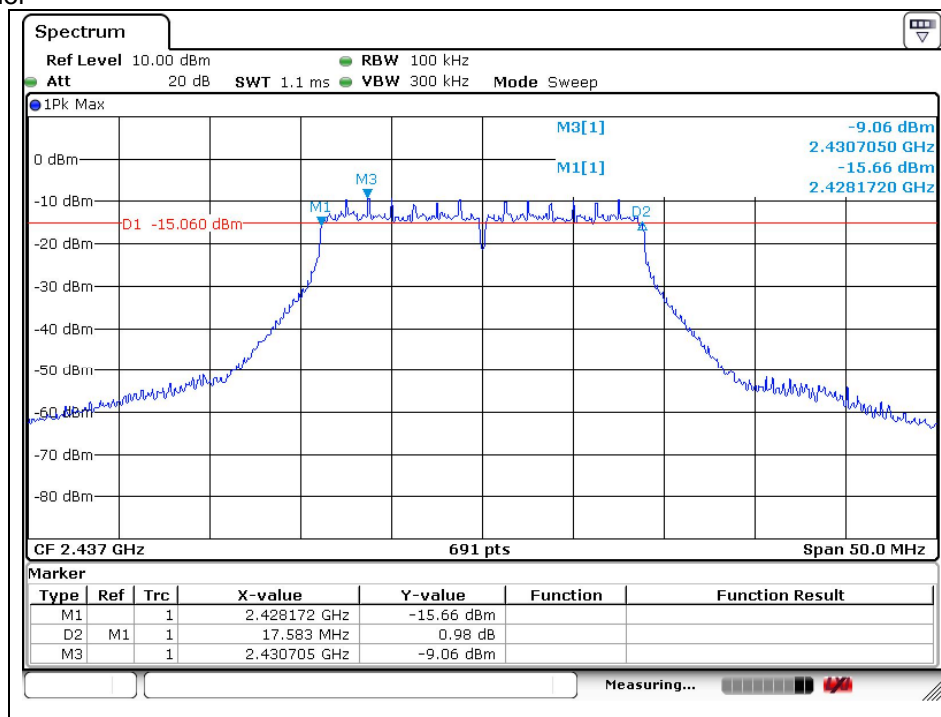
A4(210 mm x 297 mm)

## OFDM: 802.11n\_HT20

### Low Channel



### Middle Channel



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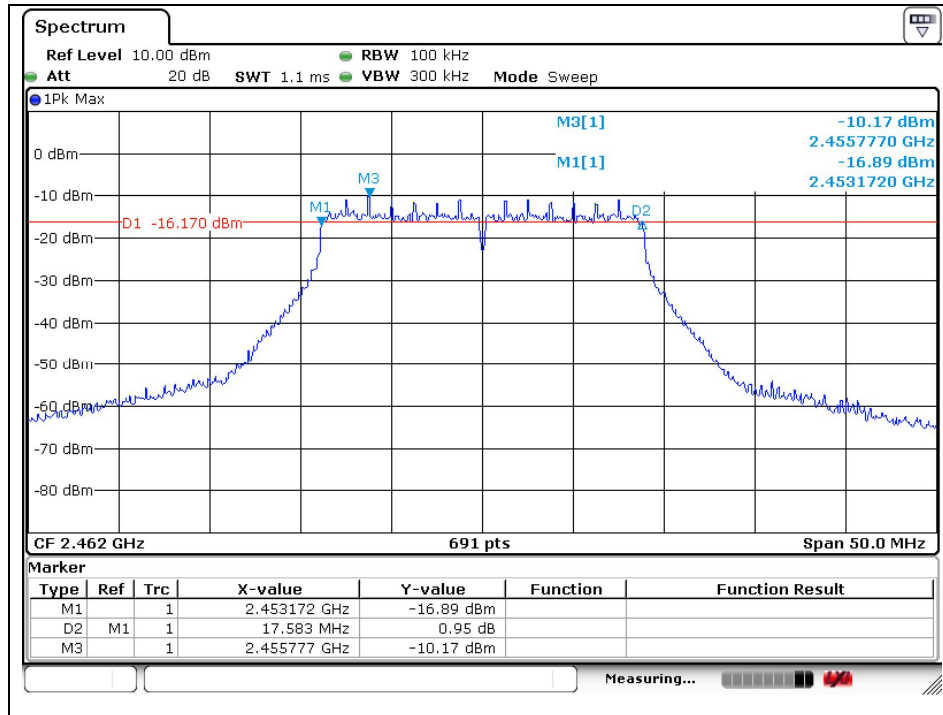
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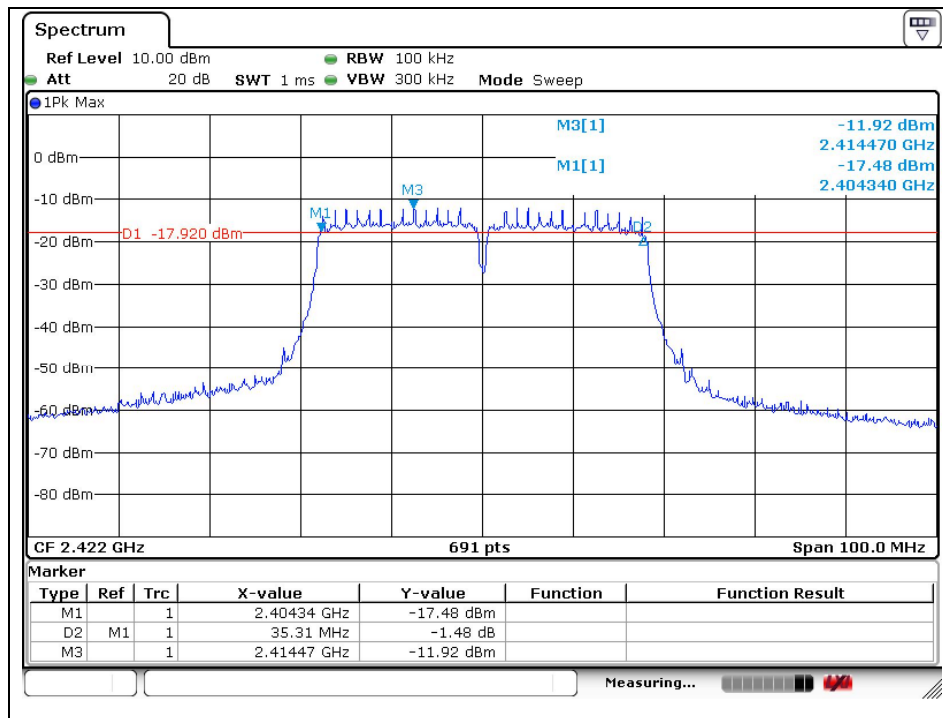
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11n\_HT40

## Low Channel



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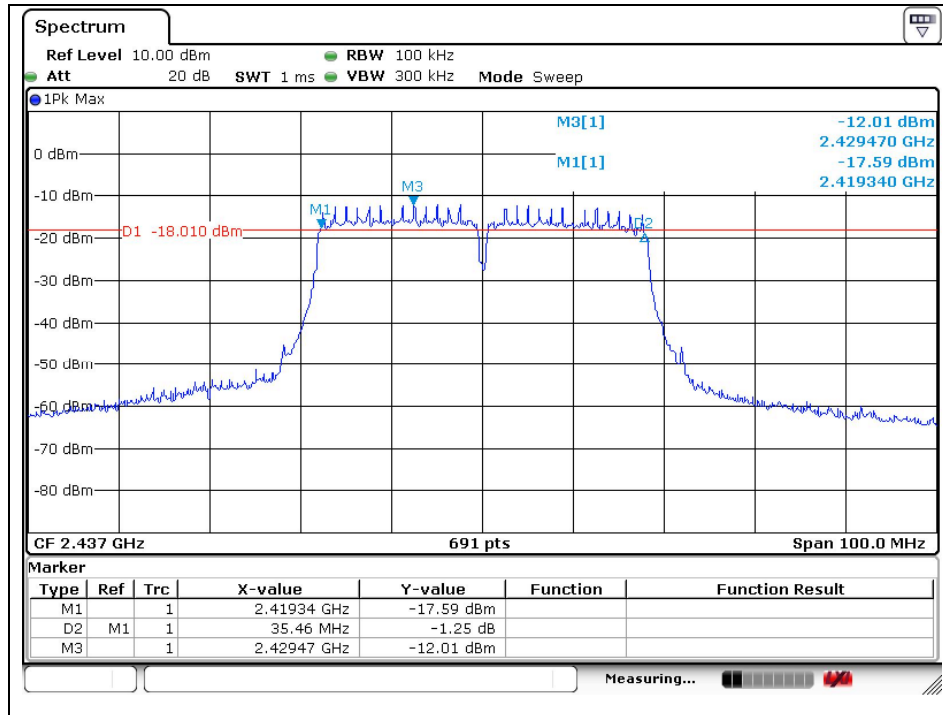
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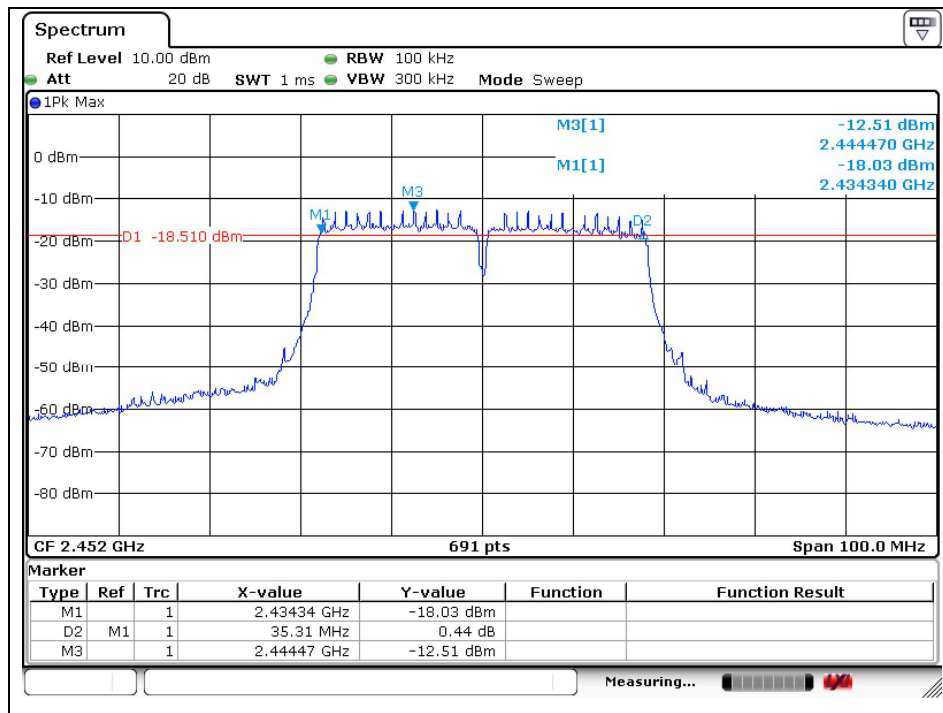
A4(210 mm x 297 mm)



## Middle Channel



## High Channel



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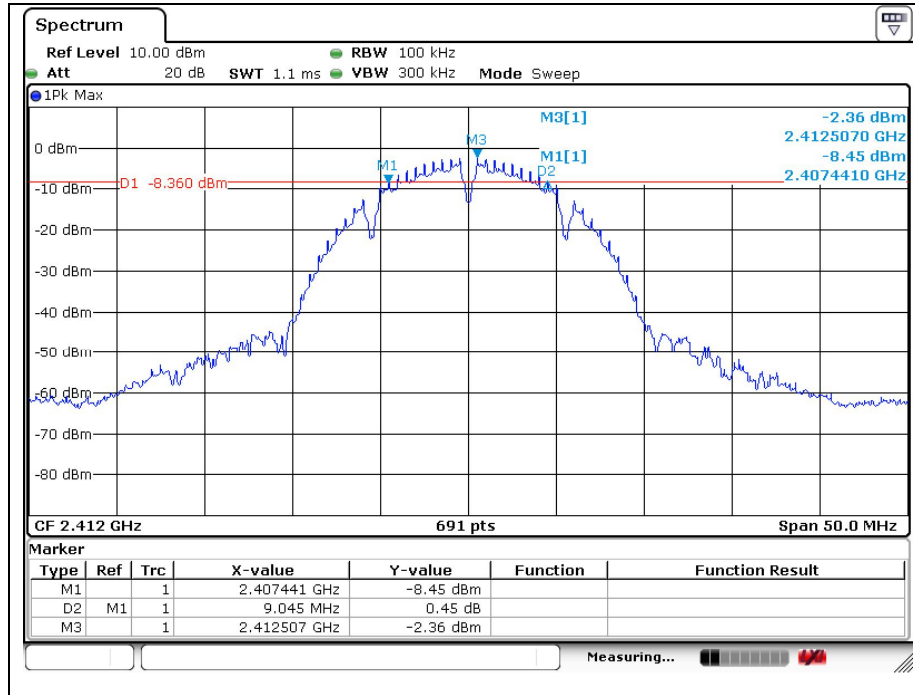
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A4(210 mm x 297 mm)

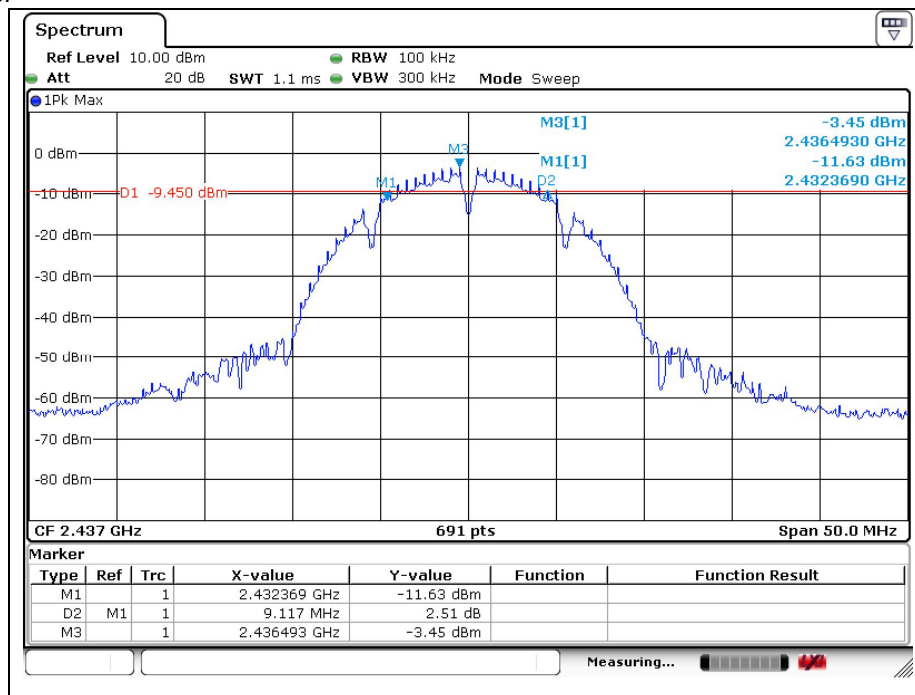
Test Condition: DC 12 V

DSSS: 802.11b

Low Channel



Middle Channel



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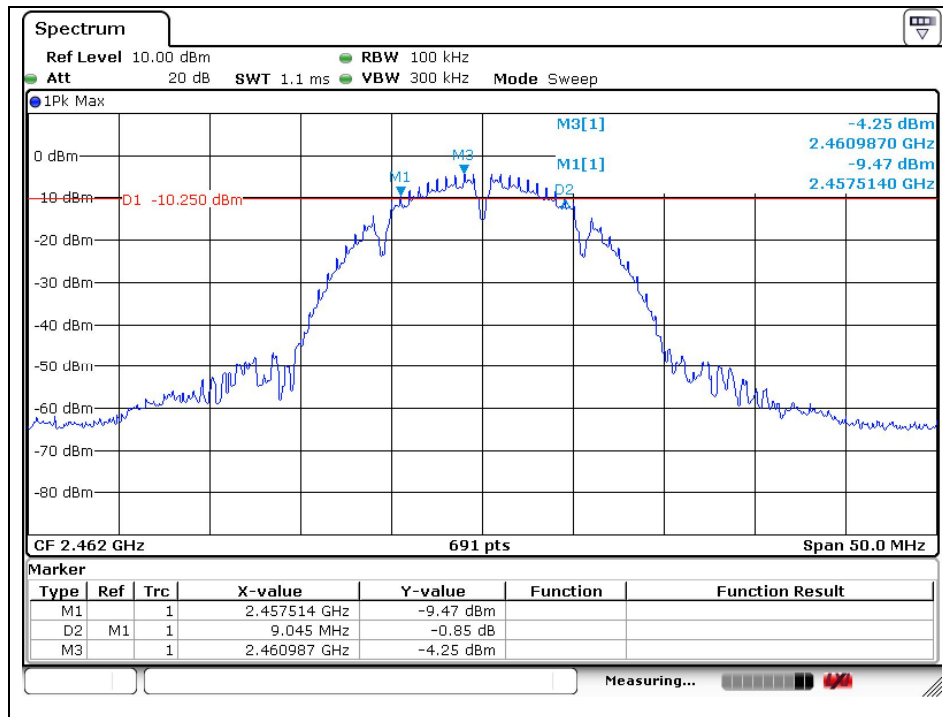
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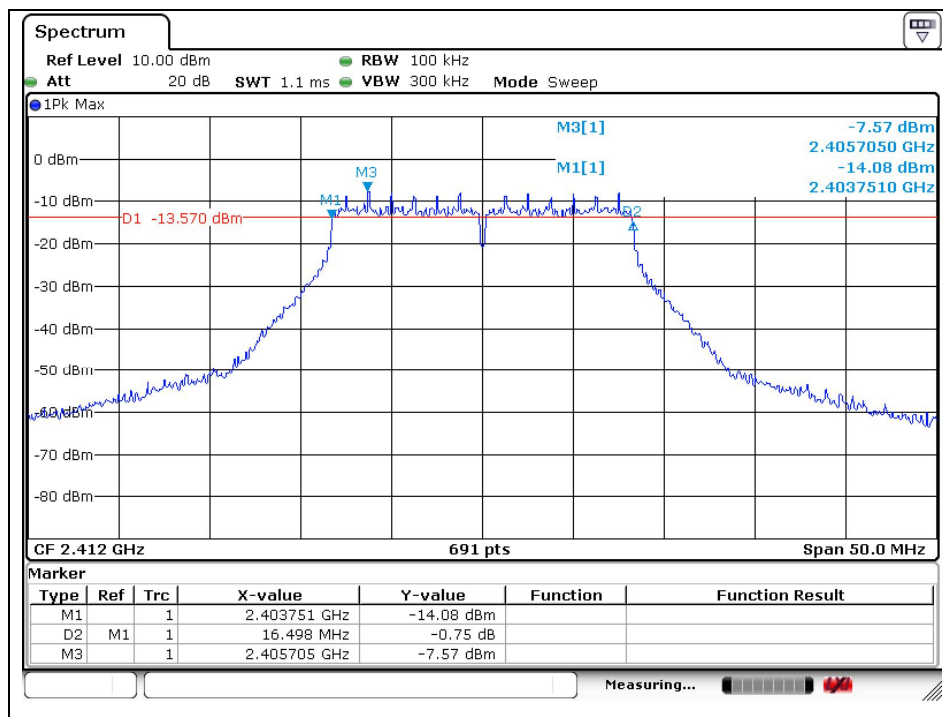
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11g

## Low Channel



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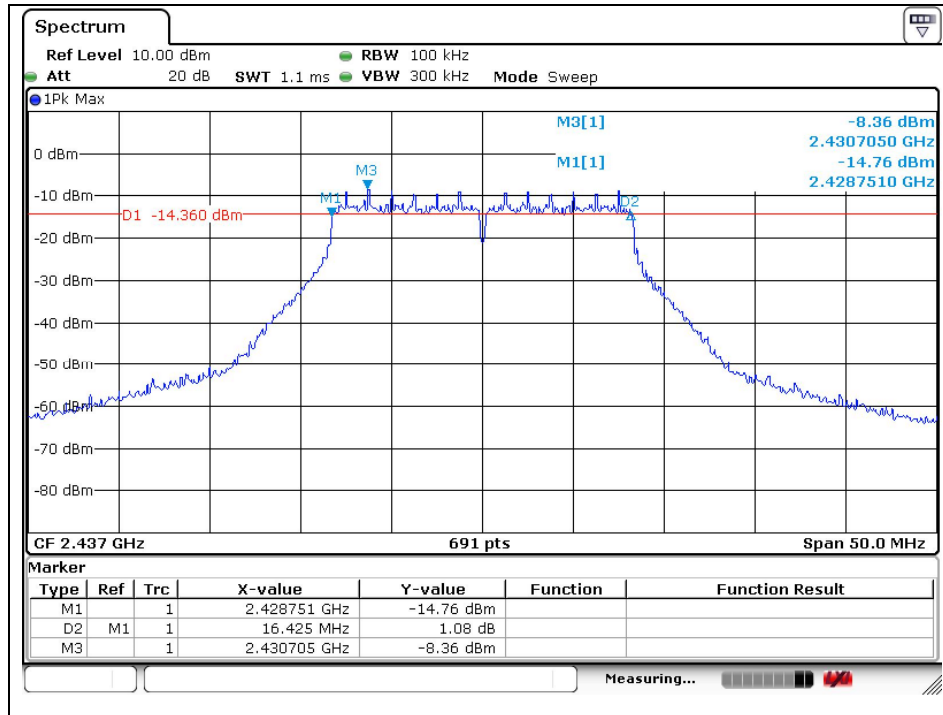
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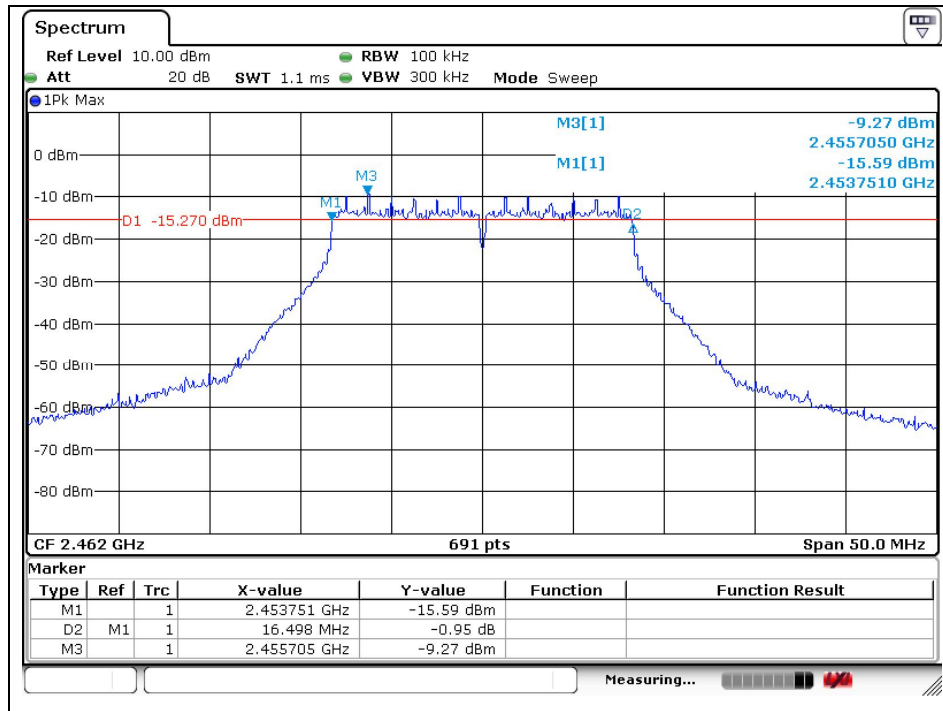
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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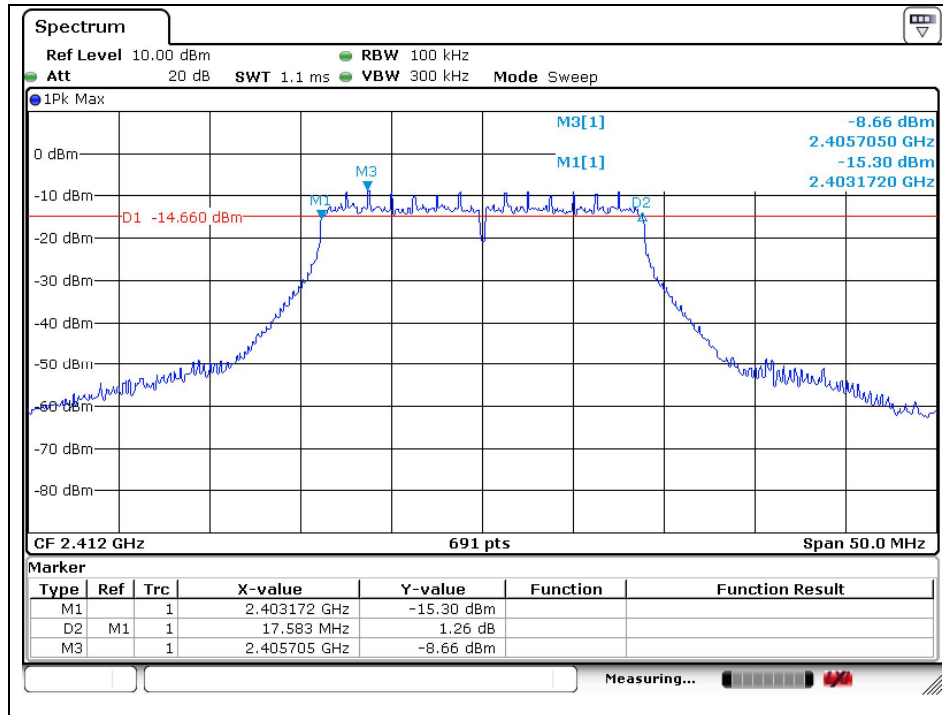
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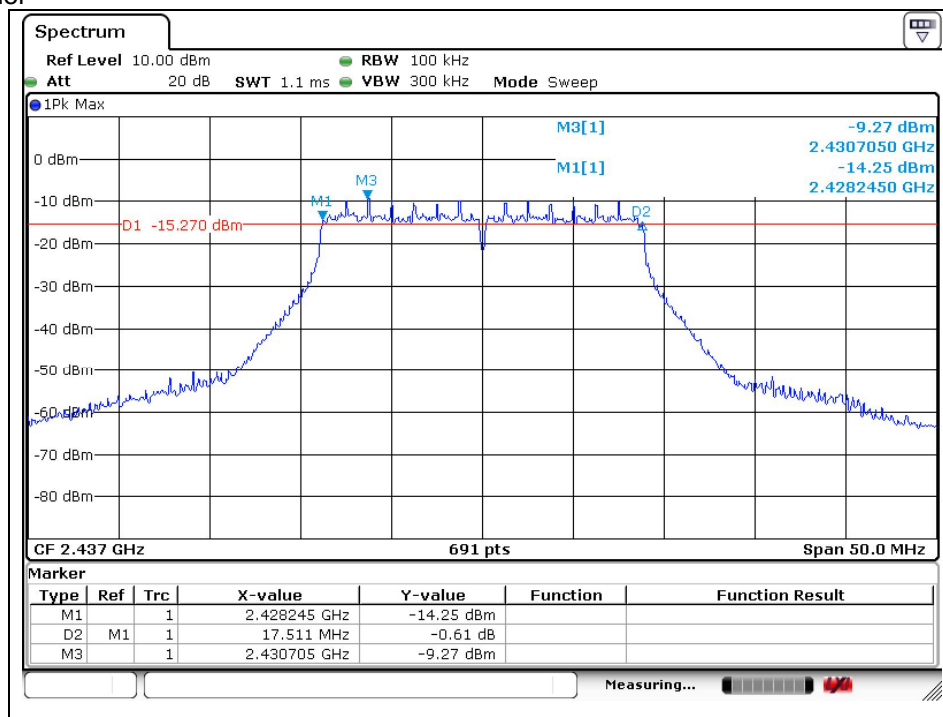
A4(210 mm x 297 mm)

## OFDM: 802.11n\_HT20

### Low Channel



### Middle Channel



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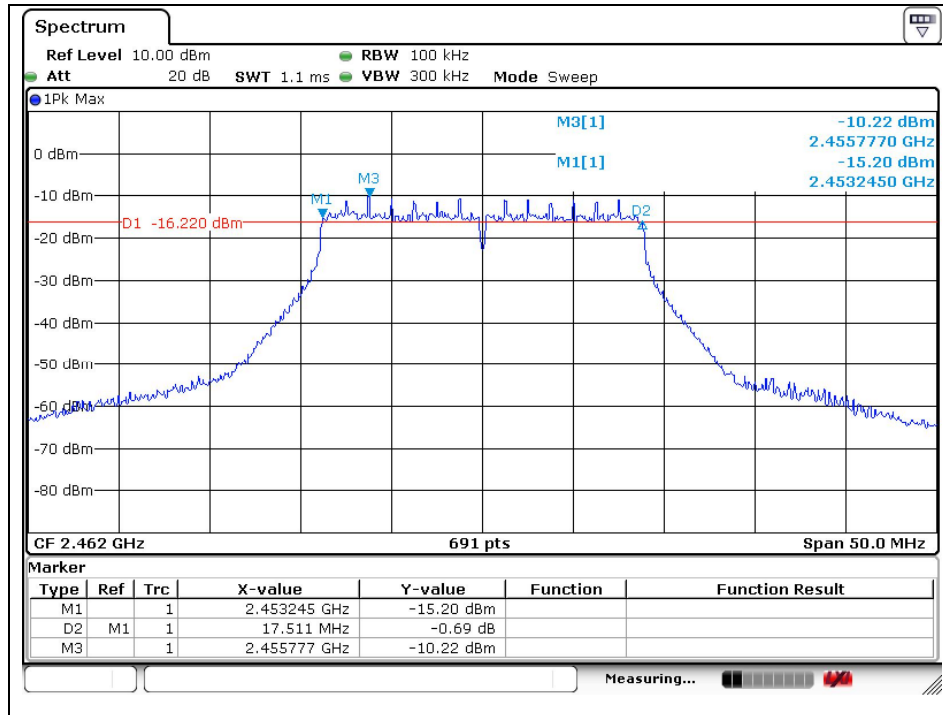
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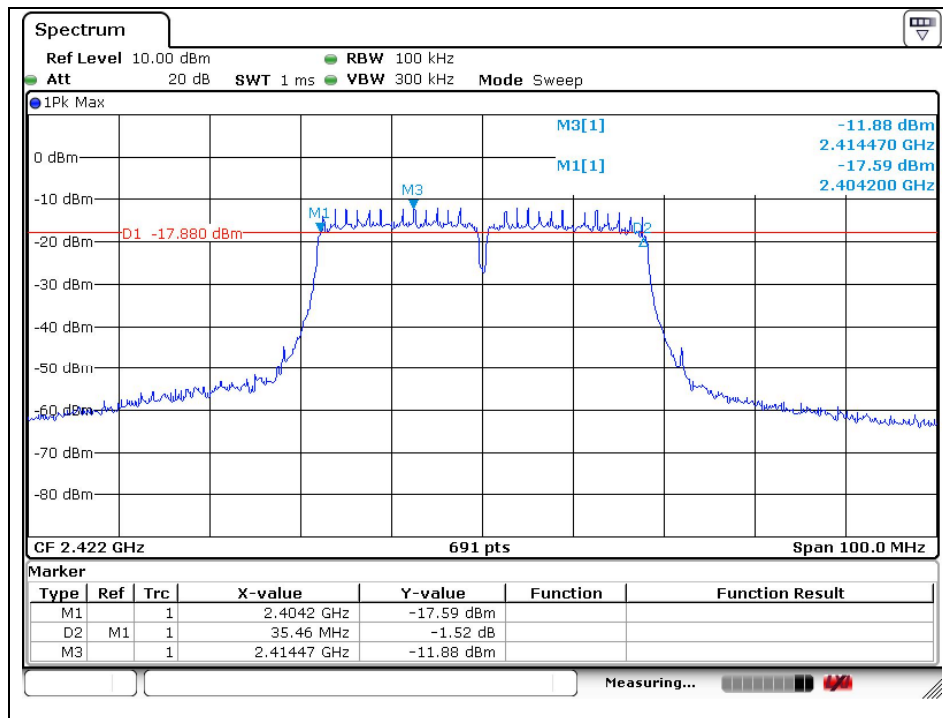
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11n\_HT40

## Low Channel



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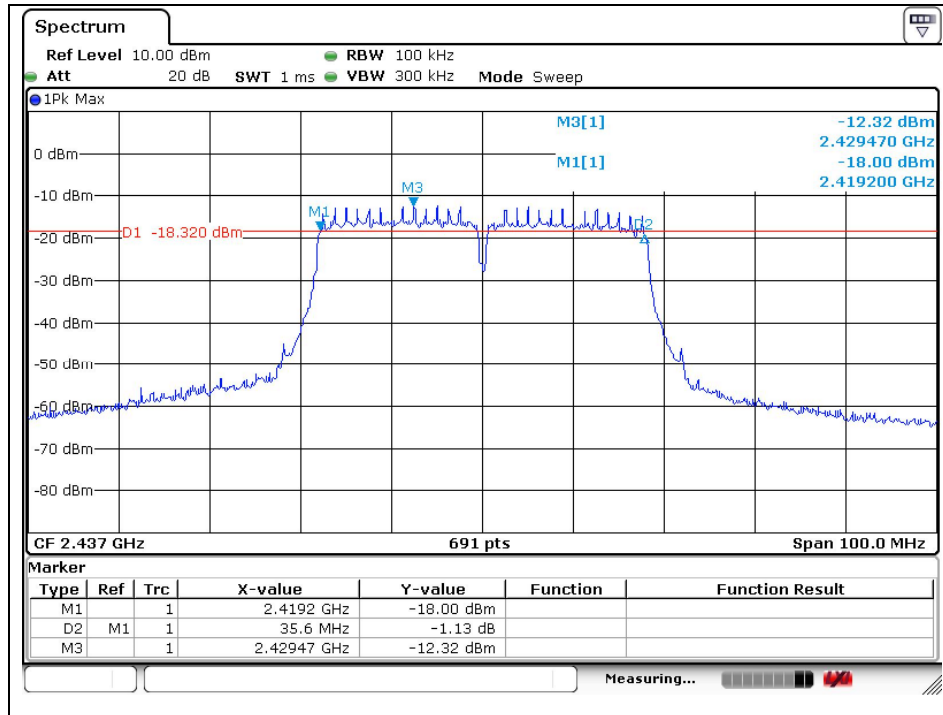
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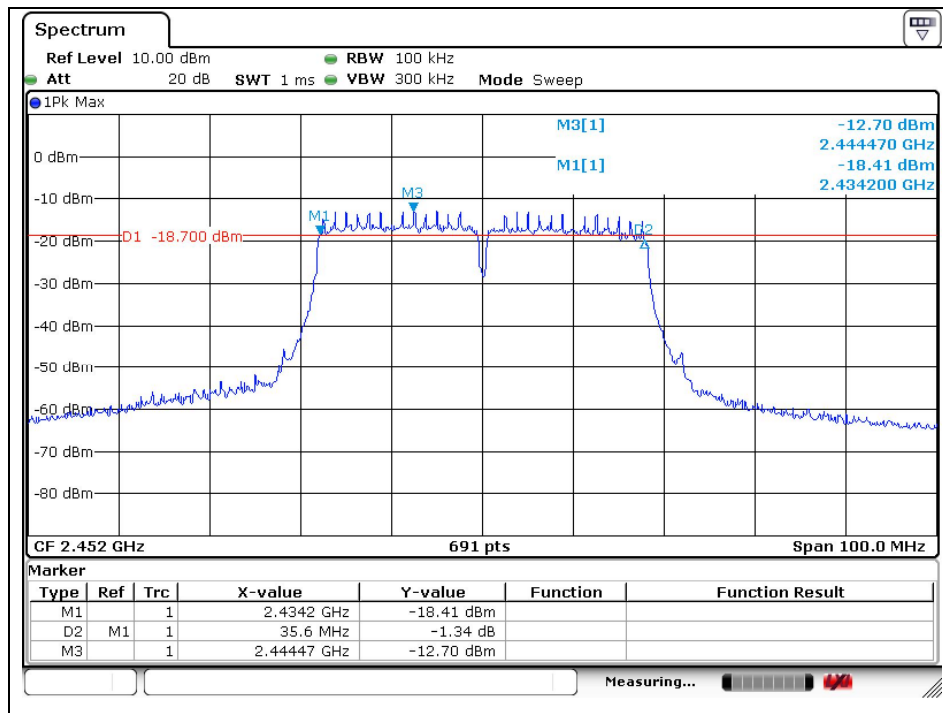
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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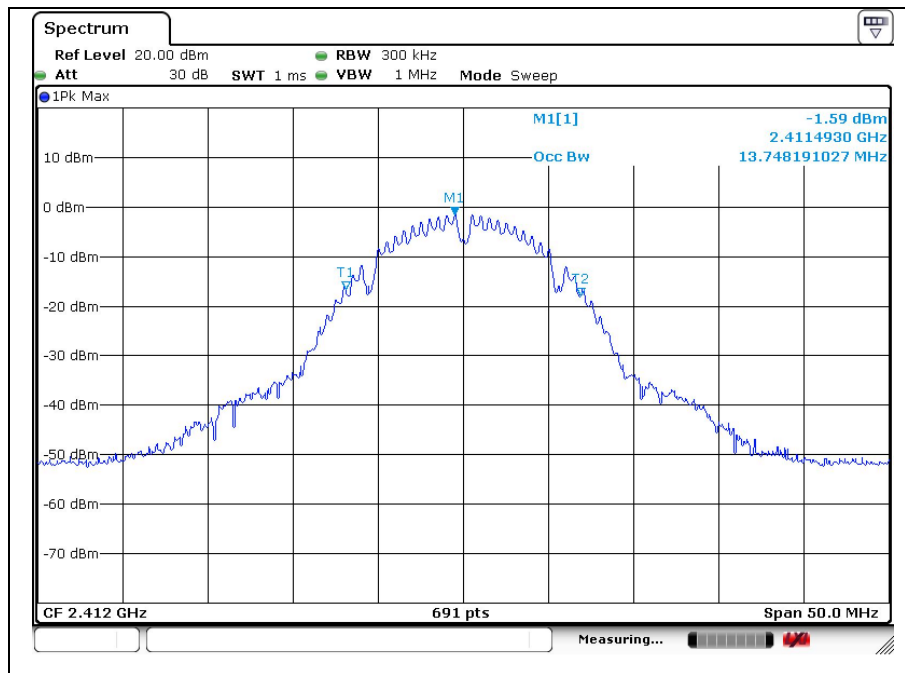
A4(210 mm x 297 mm)

## 99 % Bandwidth

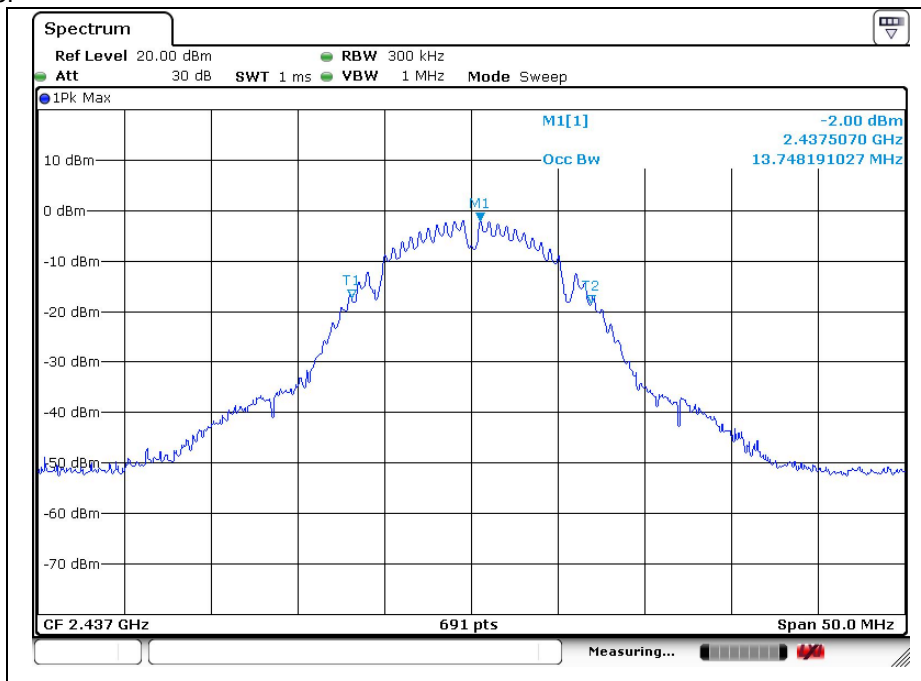
Test Condition: DC 5 V

DSSS: 802.11b

Low Channel



Middle Channel



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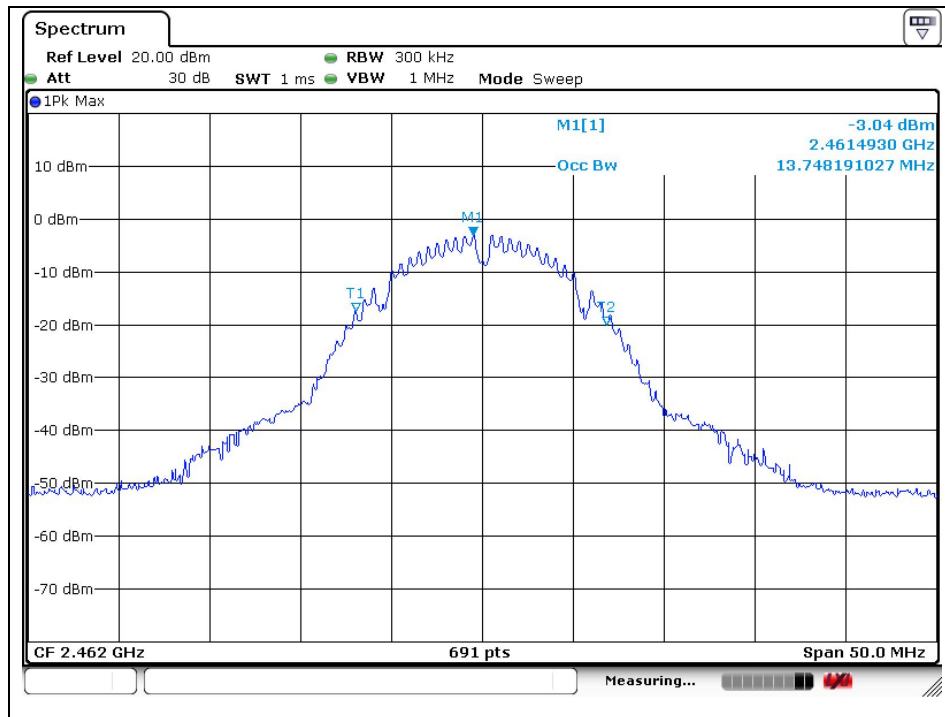
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A4(210 mm x 297 mm)

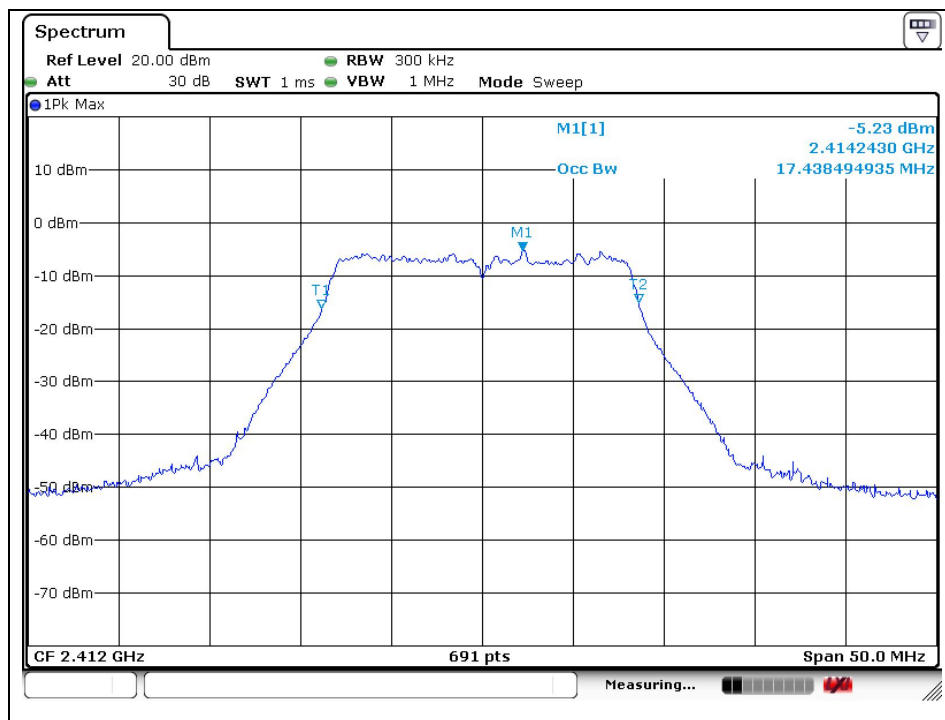


## High Channel



## OFDM: 802.11g

## Low Channel



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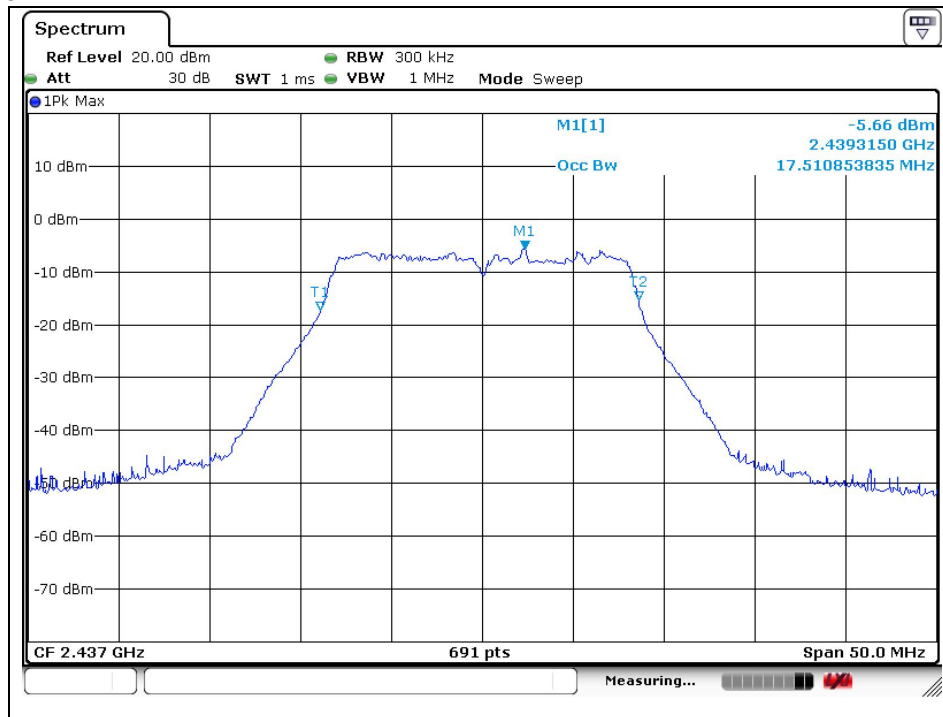
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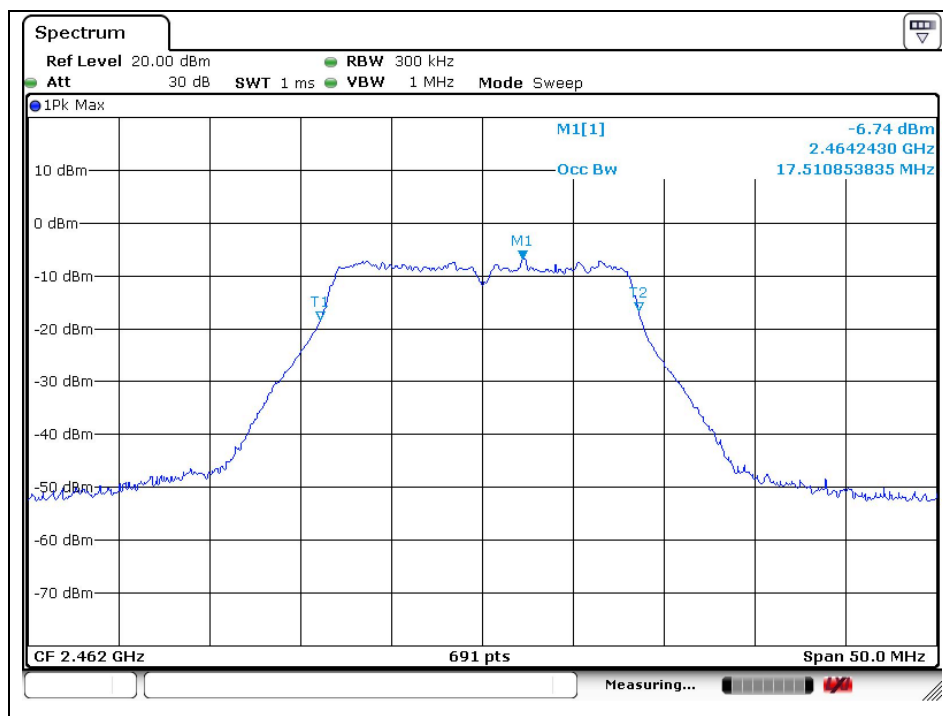
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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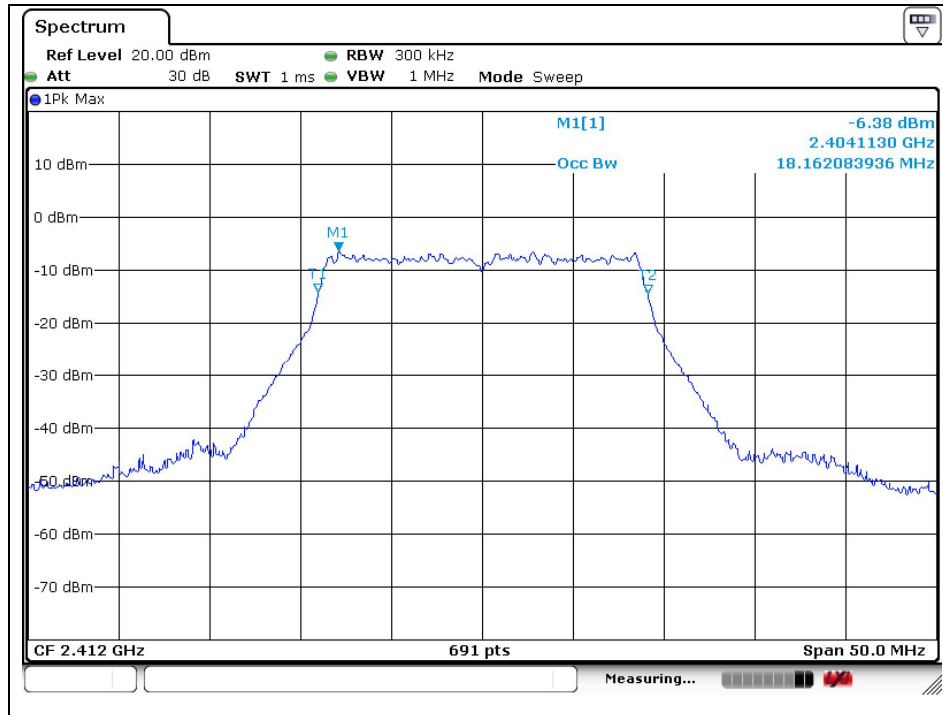
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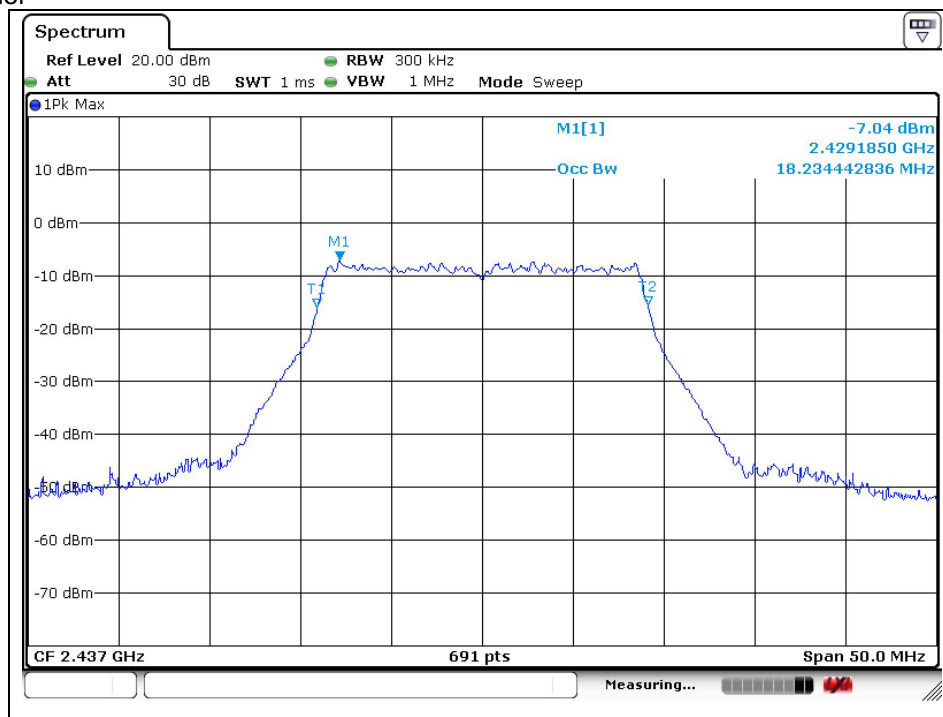
A4(210 mm x 297 mm)

## OFDM: 802.11n\_HT20

### Low Channel



### Middle Channel



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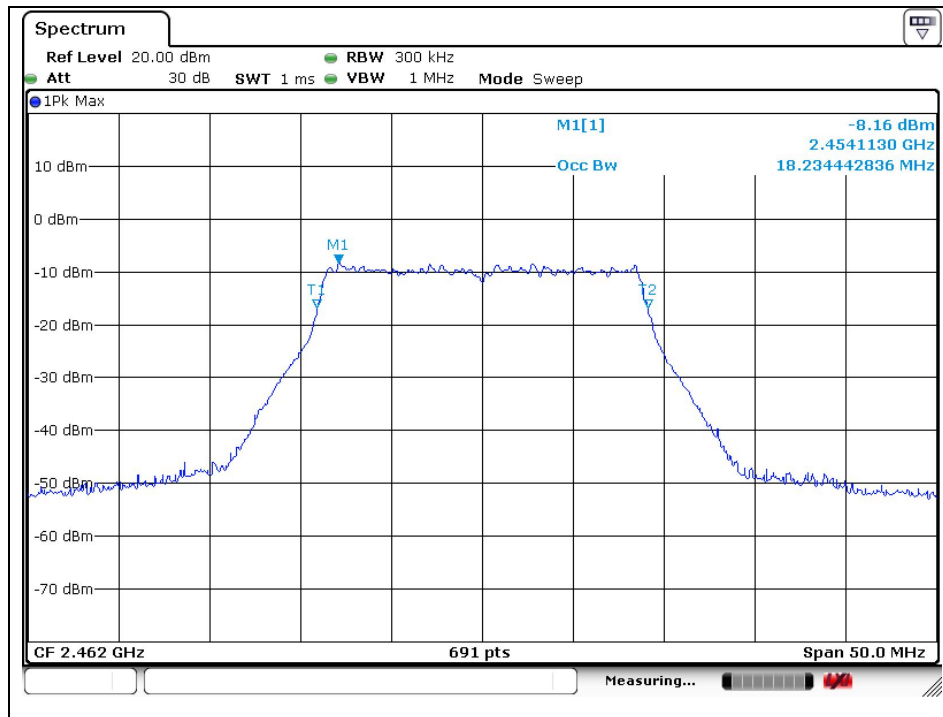
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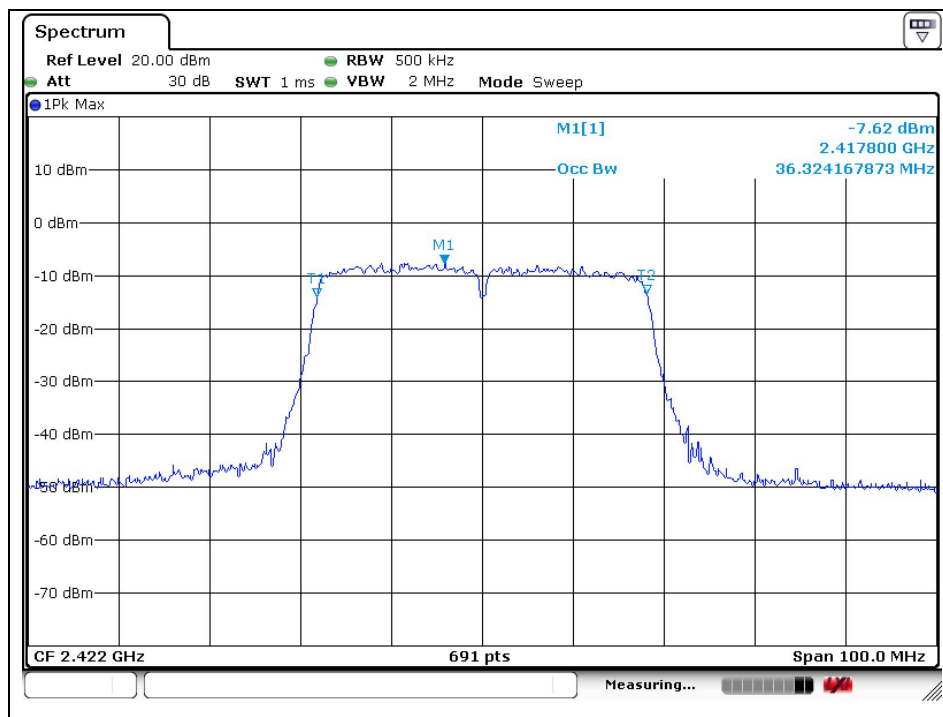
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11n\_HT40

## Low Channel



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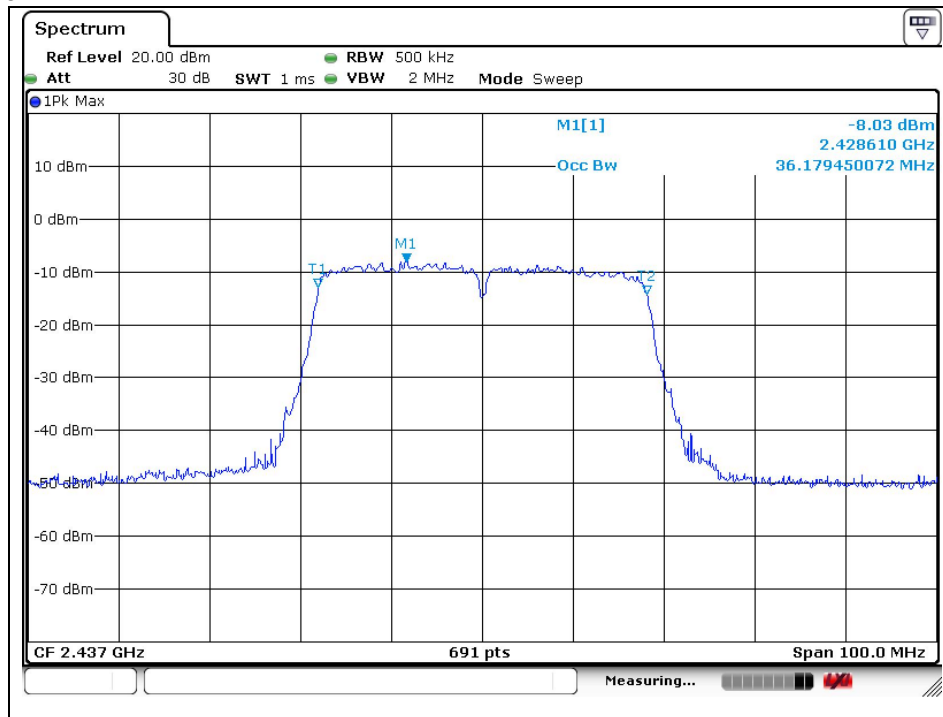
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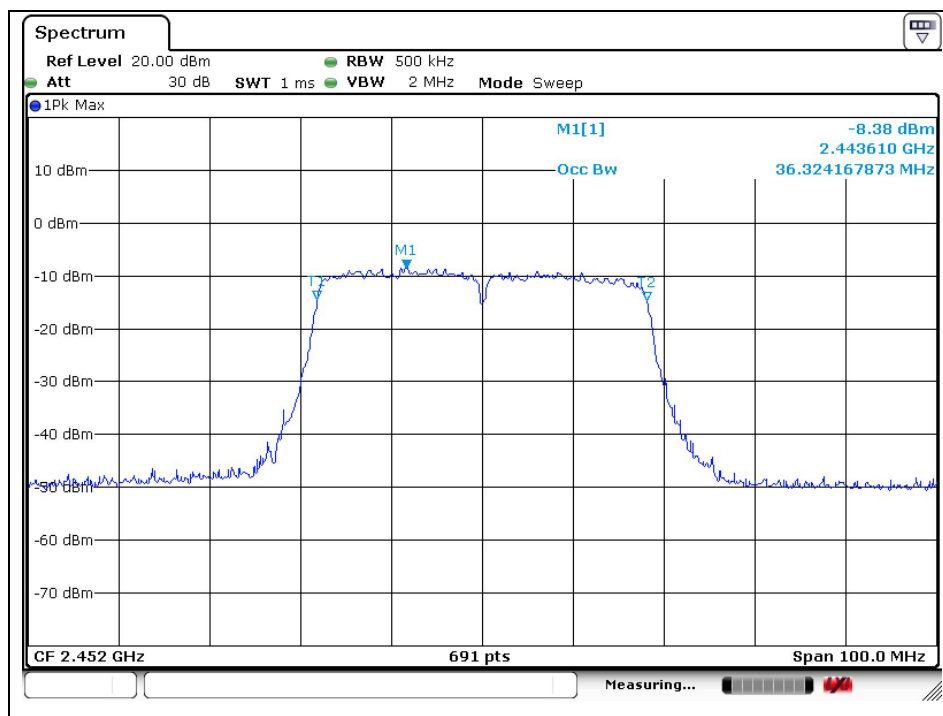
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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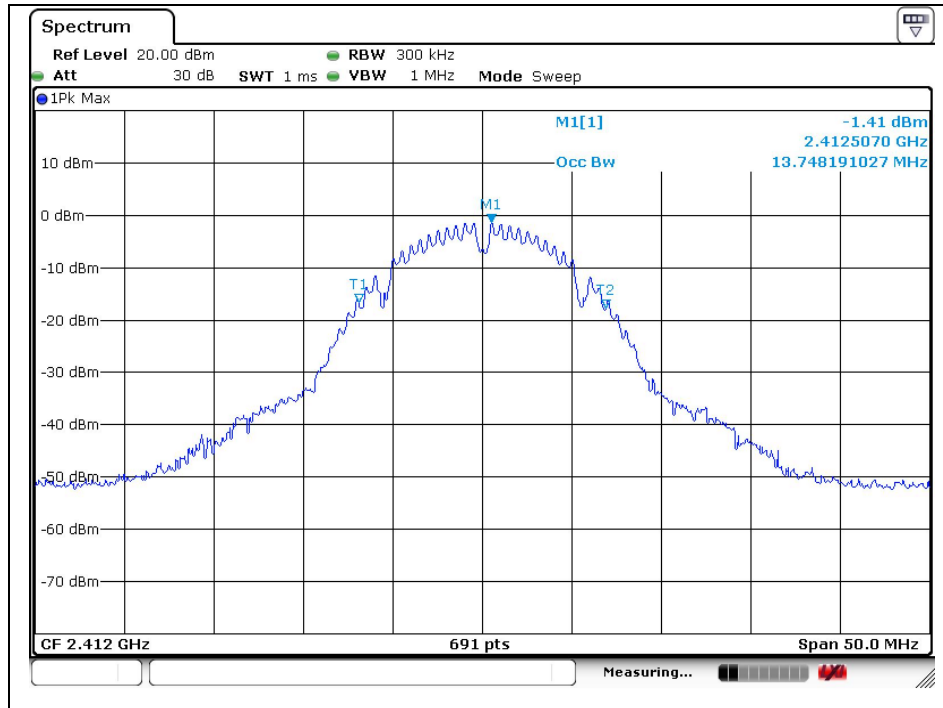
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A4(210 mm x 297 mm)

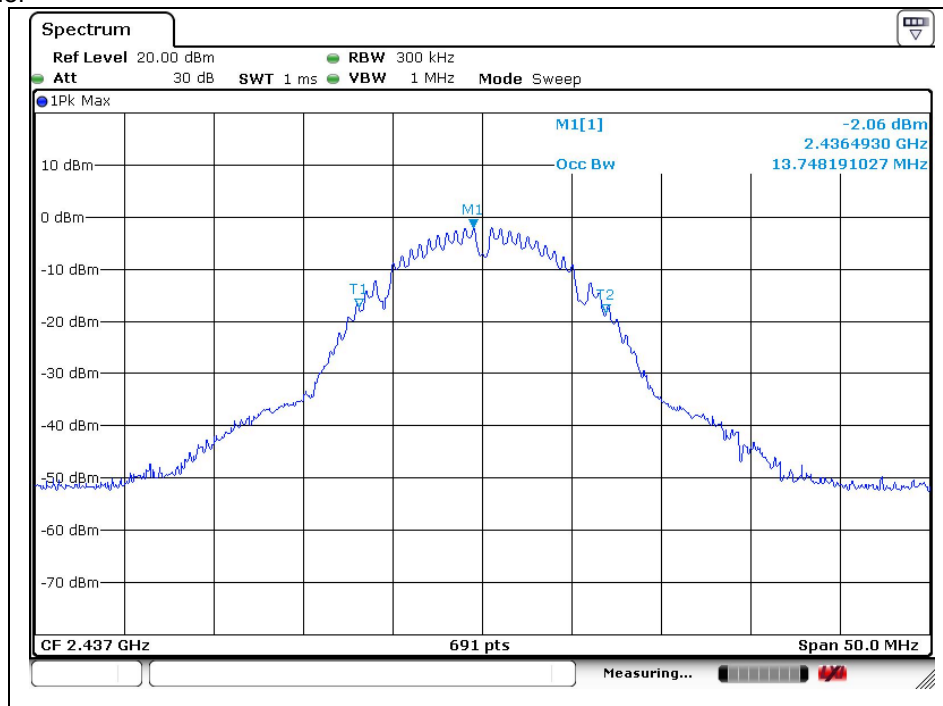
Test Condition: DC 12 V

DSSS: 802.11b

Low Channel



Middle Channel



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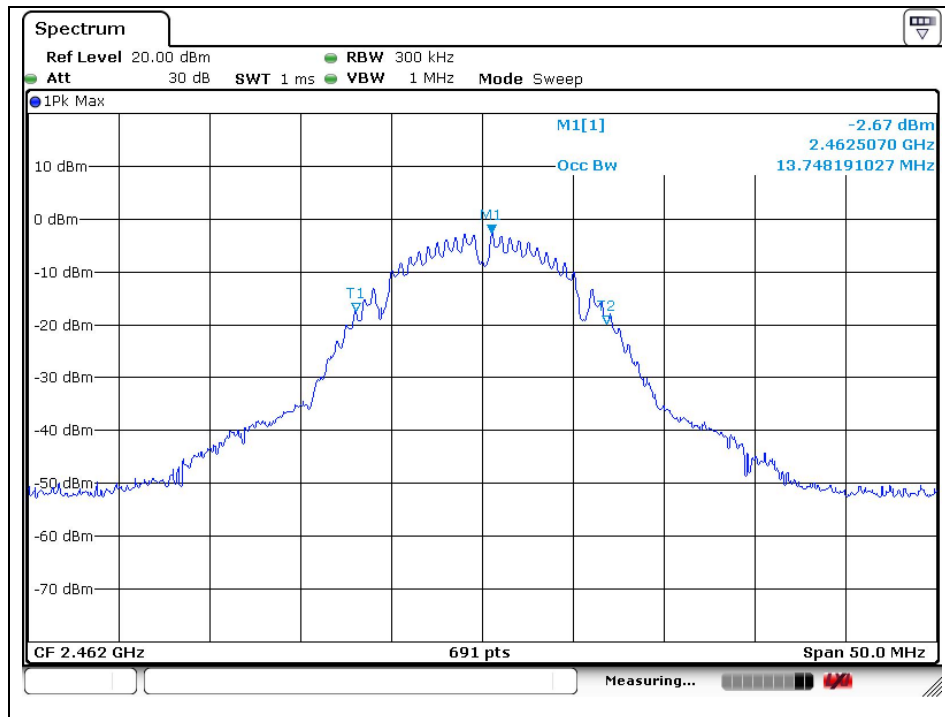
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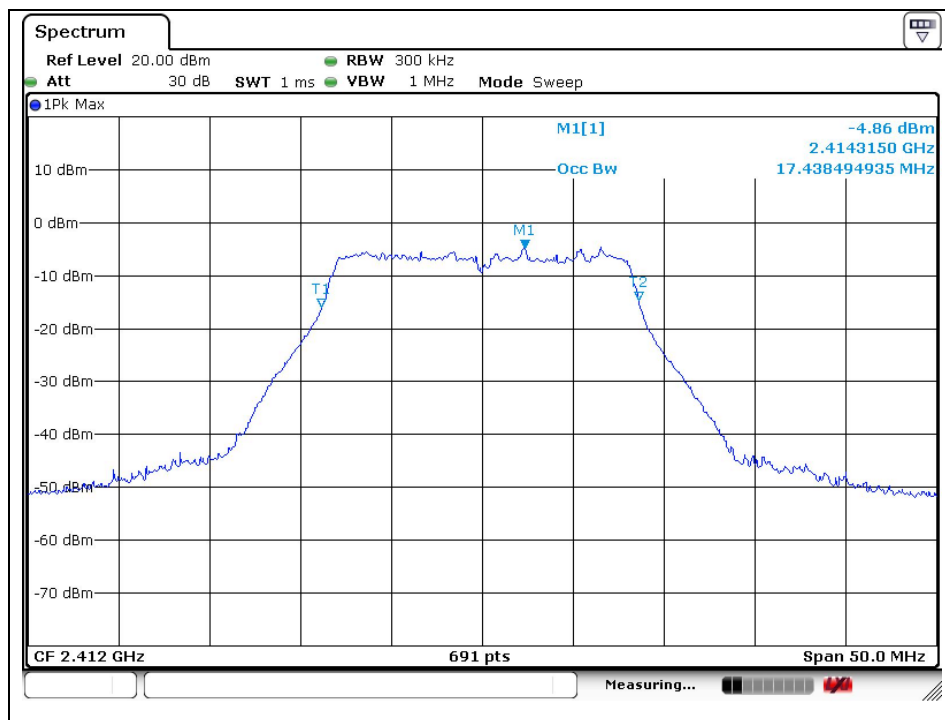
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11g

## Low Channel



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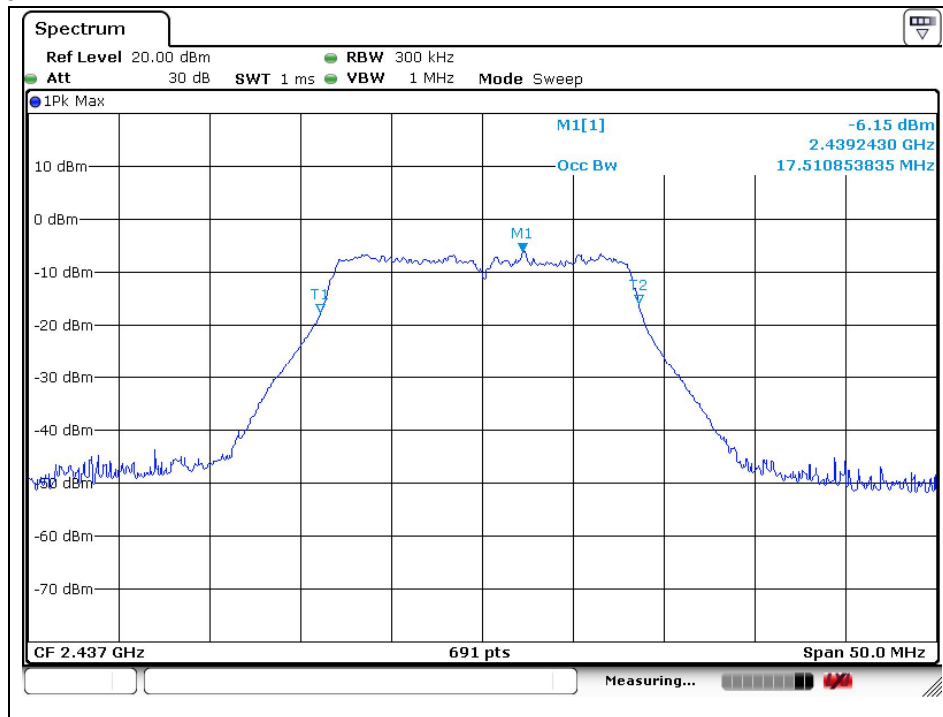
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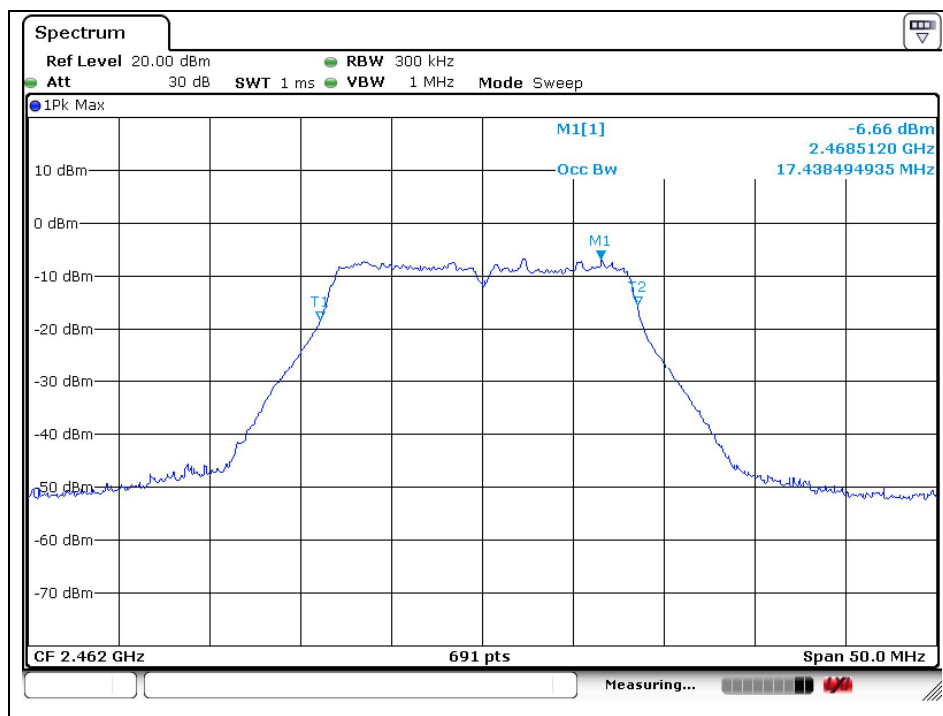
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A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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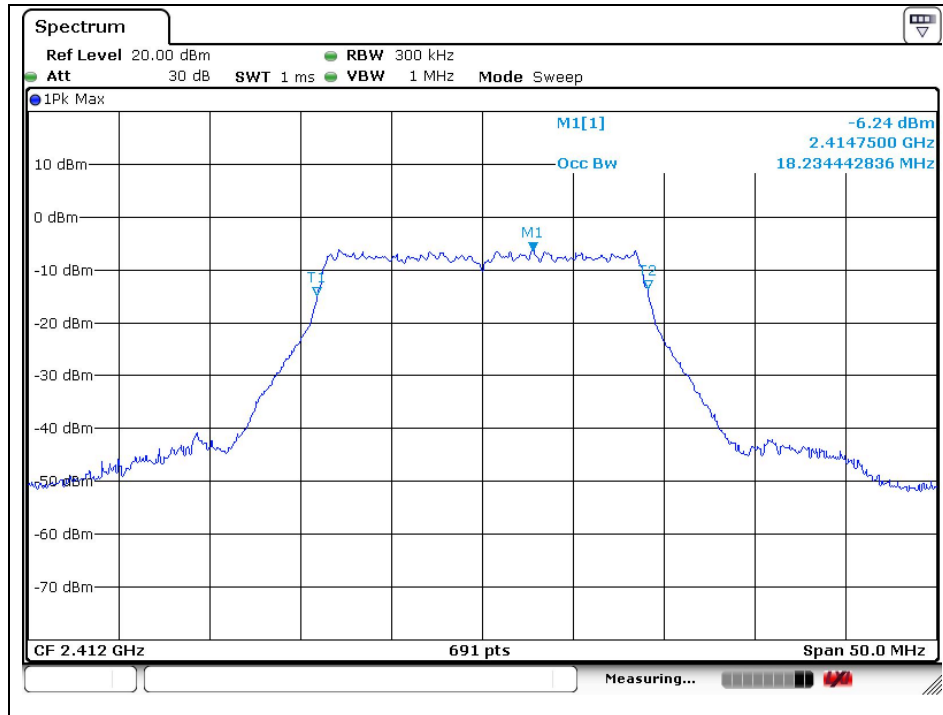
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

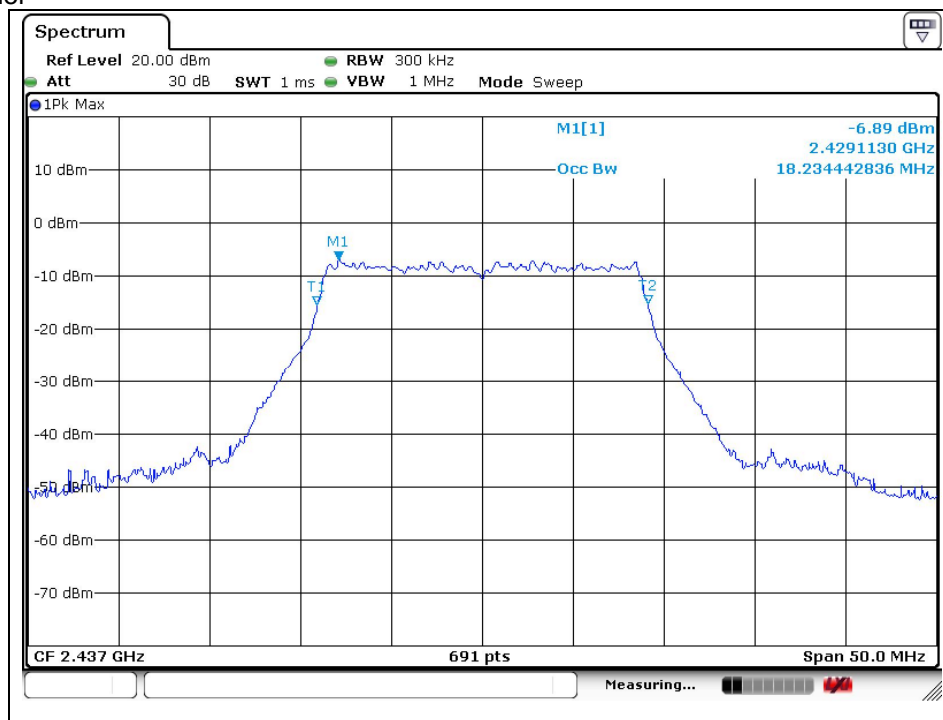


## OFDM: 802.11n\_HT20

### Low Channel



### Middle Channel



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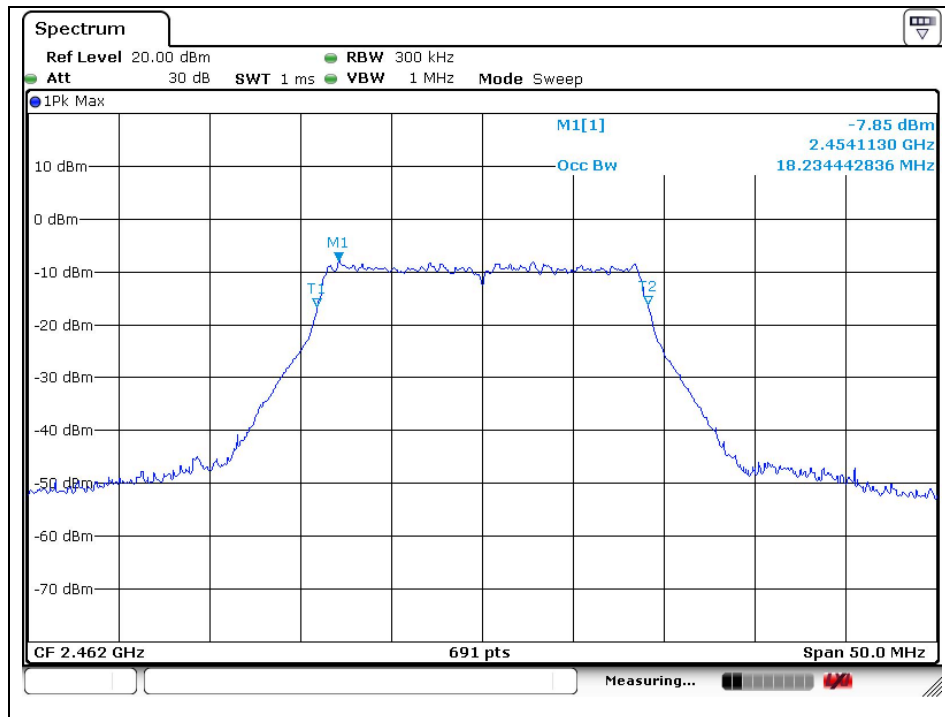
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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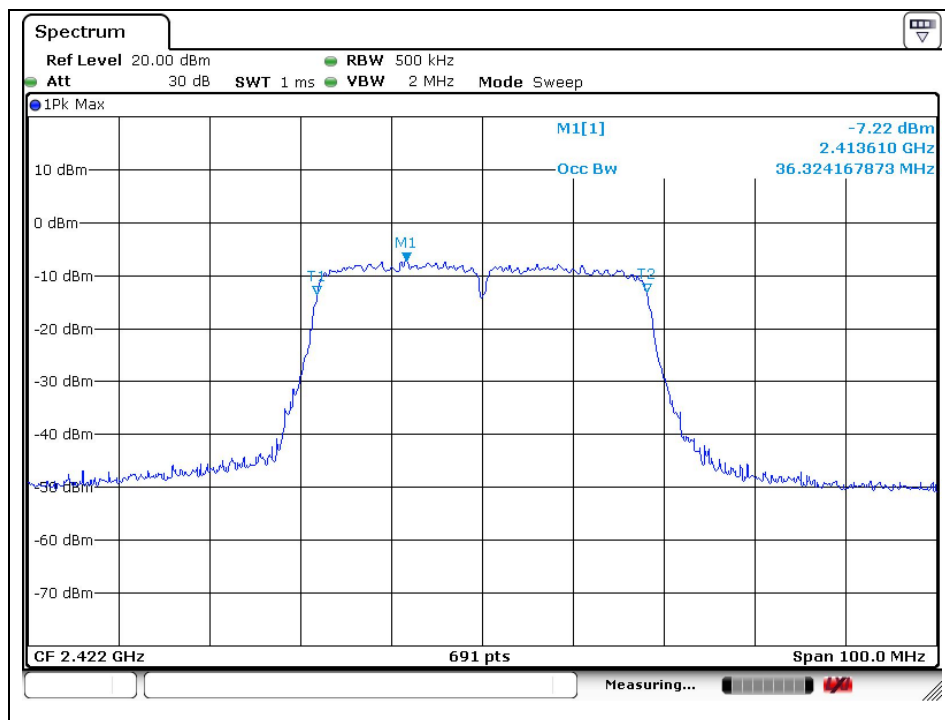
A4(210 mm x 297 mm)

## High Channel



## OFDM: 802.11n\_HT40

## Low Channel



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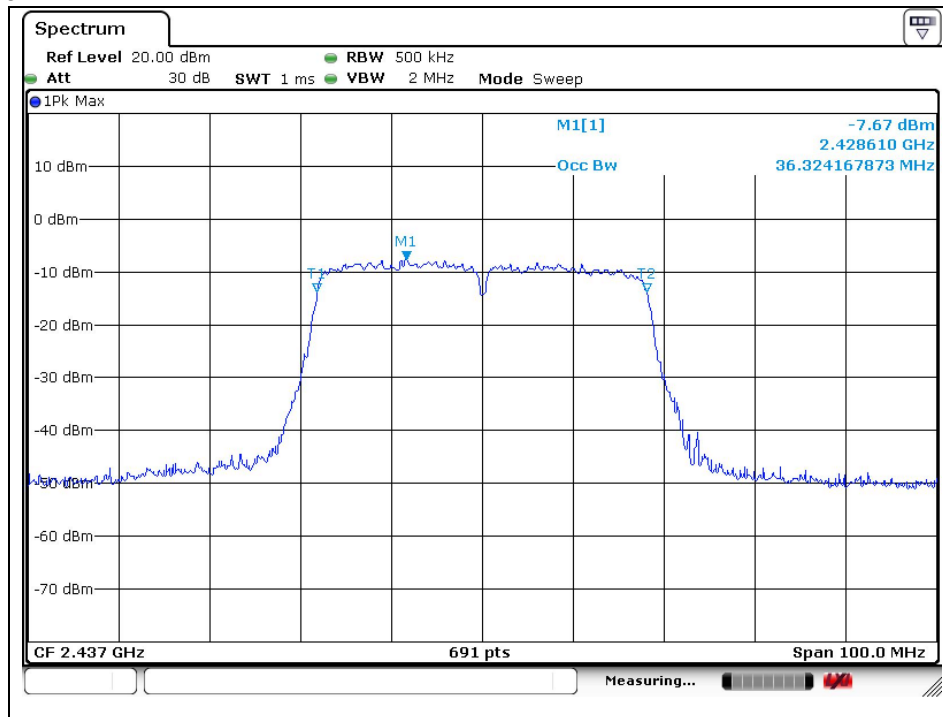
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

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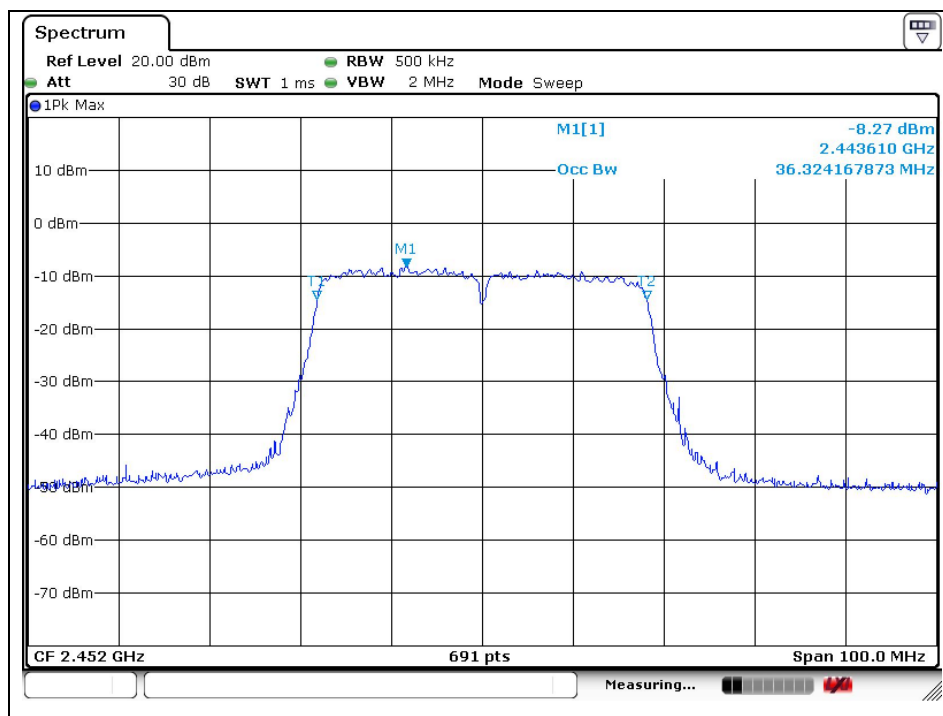
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

## Middle Channel



## High Channel



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A4(210 mm x 297 mm)