7. POWER SPECTRAL DENSITY MEASUREMENT

7.1. Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Due Date
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2014. 07. 30

7.2. Block Diagram of Test Setup

The same as section.5.2.

7.3. Specification Limits [§15.407(a)-(1)(2)(3)]

For the band 5.15-5.25GHz, the maximum power spectral density shall not exceed 4dBm in any 1MHz band.

For the band 5.25-5.35GHz and 5.47-5.725GHz, the maximum power spectral density shall not exceed 11dBm in any 1MHz band.

For the band 5.725-5.85GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.

7.4. Operating Condition of EUT

The test program "WL command" was used to enable the EUT to transmit data at different channel frequency individually.

7.5. Test Procedure

7.5.1. For UNII Band I, UNII Band II-2A and UNII Band II-2C

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW=1MHz
3. Set VBW≥3MHz
4. Detector=RMS (i.e., power averaging), if available, Otherwise, use sample detector mode.
5. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
6. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.

The measurement guideline was according to KDB789033 D01 v01r03

7.5.2. For UNII Band III

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 100kHz RBW and ≥300kHz VBW, set sweep time = Auto.

The measurement guideline was according to KDB 558074 D01 DTS Meas Guidance is v03r01.

Pursuant to KDB 662911, we performed conducted tests for both antenna chains and submit test data measured on chain 0 as worse performance.

7.6. Test Results

PASSED. All the test results are attached in next pages.

Test Date : 2014. 05. 02 Temperature : 26℃ Humidity : 50%
Test Date: 2014. 05. 06 Temperature: 23℃ Humidity: 48%

7.6.1. For 802.11a

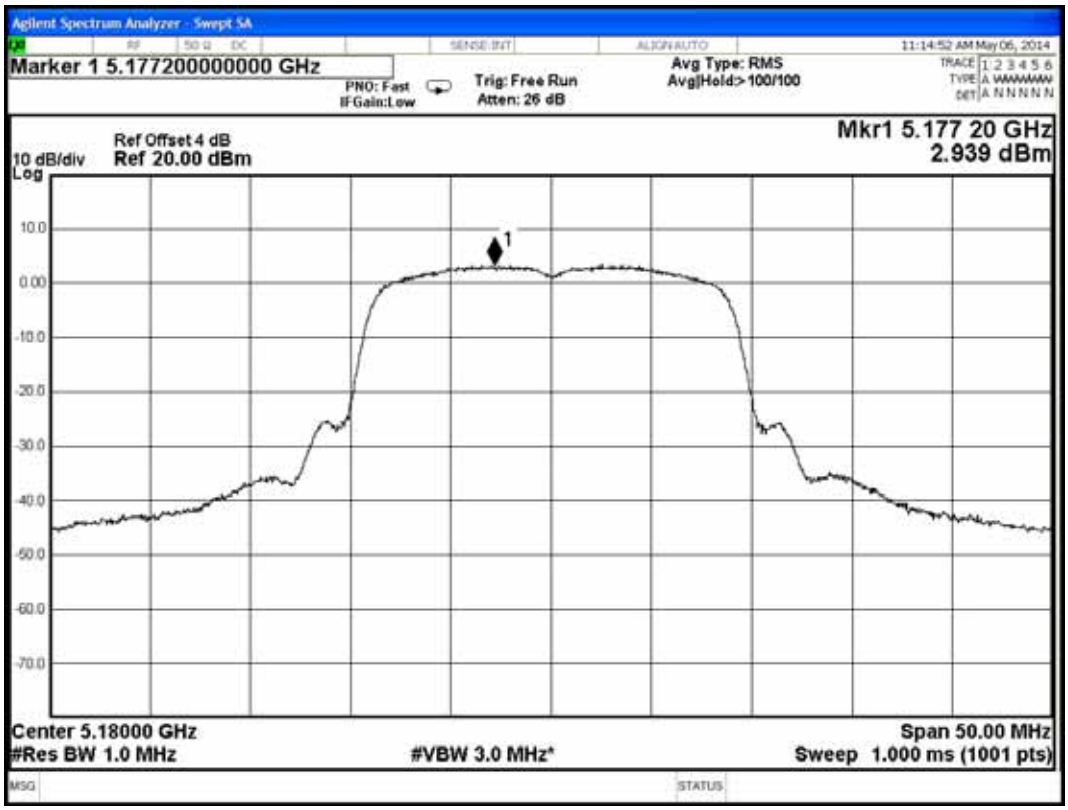
Mode	UNII Band	Channel	Frequency	**Power Spectral Density (dBm)**	**Limit (dBm)**
1.	UNII Band I	CH 36	5180MHz	**2.939**	**4**
2.		CH 40	5200MHz	**3.290**	**4**
3.		CH 48	5240MHz	**3.143**	**4**
4.	UNII Band II-2A	CH 52	5260MHz	**3.726**	**11**
5.		CH 56	5280MHz	**3.889**	**11**
6.		CH 64	5320MHz	**2.639**	**11**
7.	UNII Band II-2C	CH 100	5500MHz	**1.901**	**11**
8.		CH 116	5580MHz	**2.470**	**11**
9.		CH 140	5700MHz	**0.630**	**11**

Mode	UNII Band	Channel	Frequency	**Power Density (dBm/100kHz)**	**BWCF Factor 100kHz to 500kHz**	**Total Power Density**
10.	UNII Band III	CH 149	5745MHz	**-0.391**	**6.989**	**6.598**
11.		CH 157	5785MHz	**-0.427**		**6.562**
12.		CH 165	5825MHz	**-3.709**		**3.280**

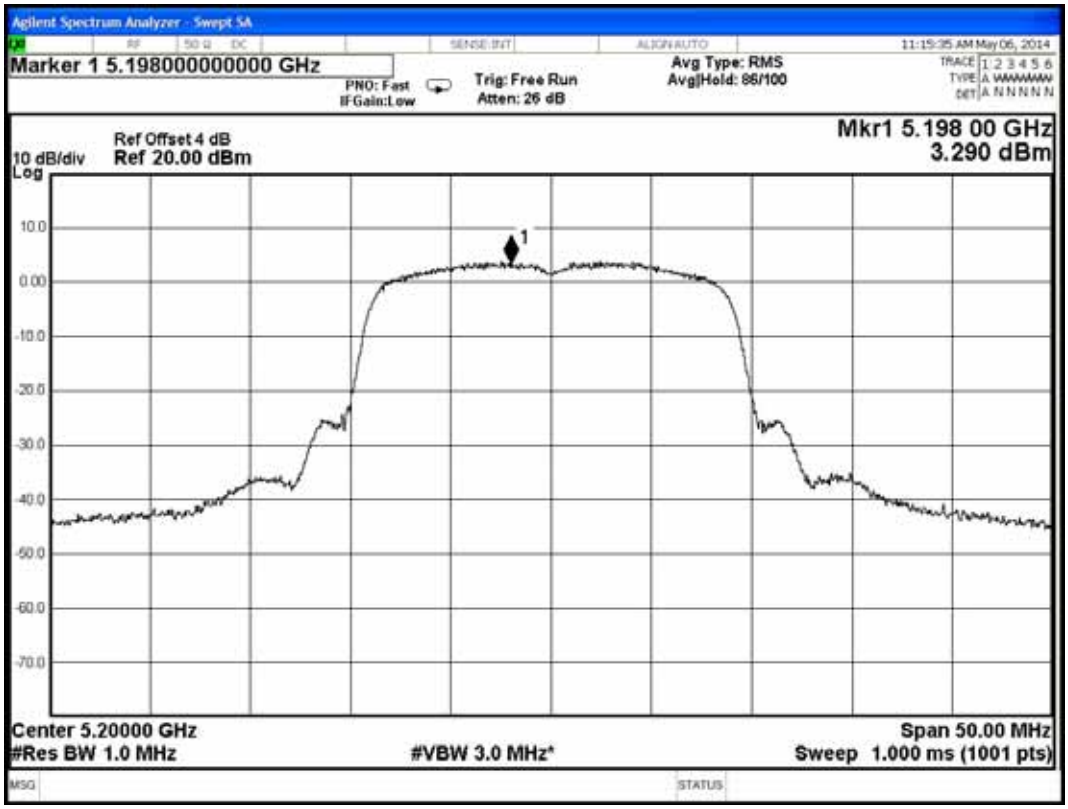
Limit: 30dBm

Note: 1. BCW Factor= 10 log (500/100)
2. Total Power Density= Power Density + BWCF Factor

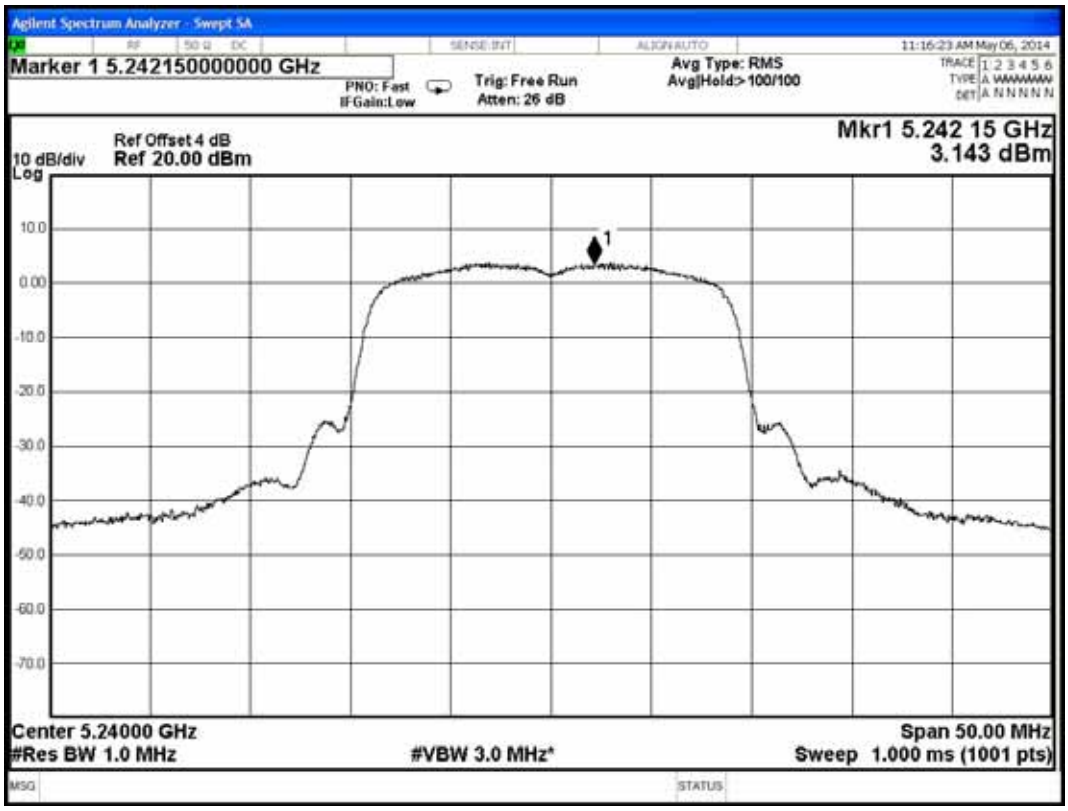
802.11a (UNII Band I), Frequency: 5180MHz



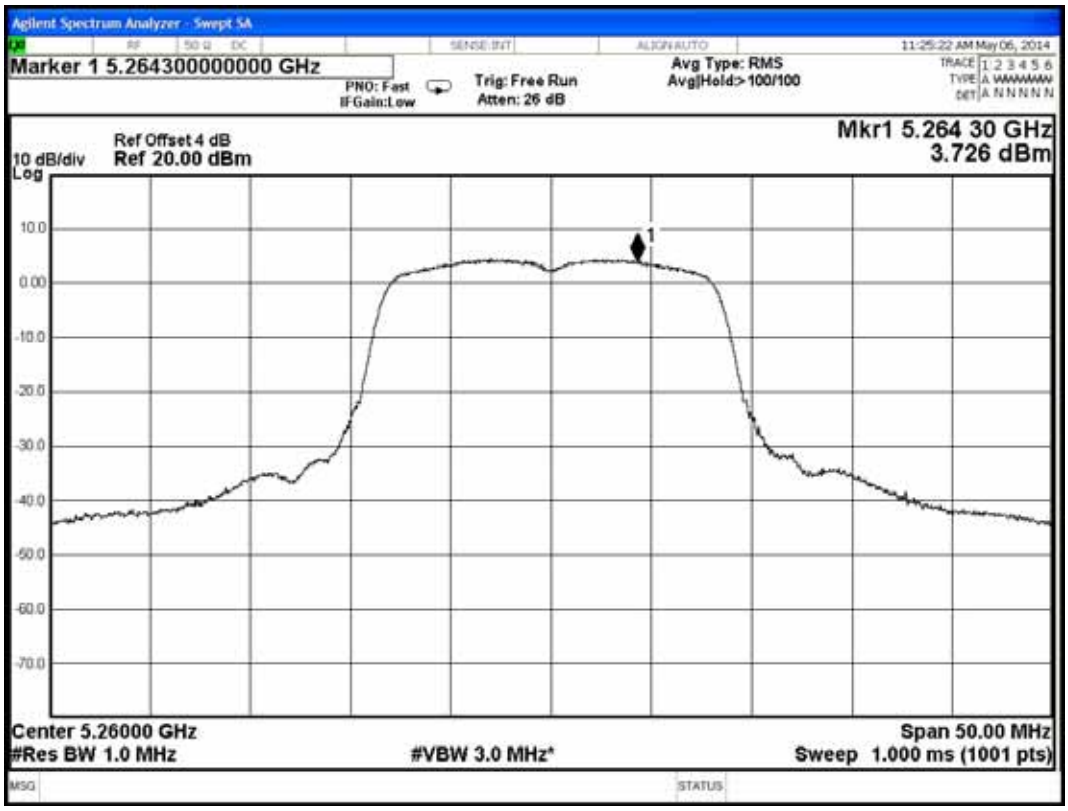
802.11a (UNII Band I), Frequency: 5200MHz



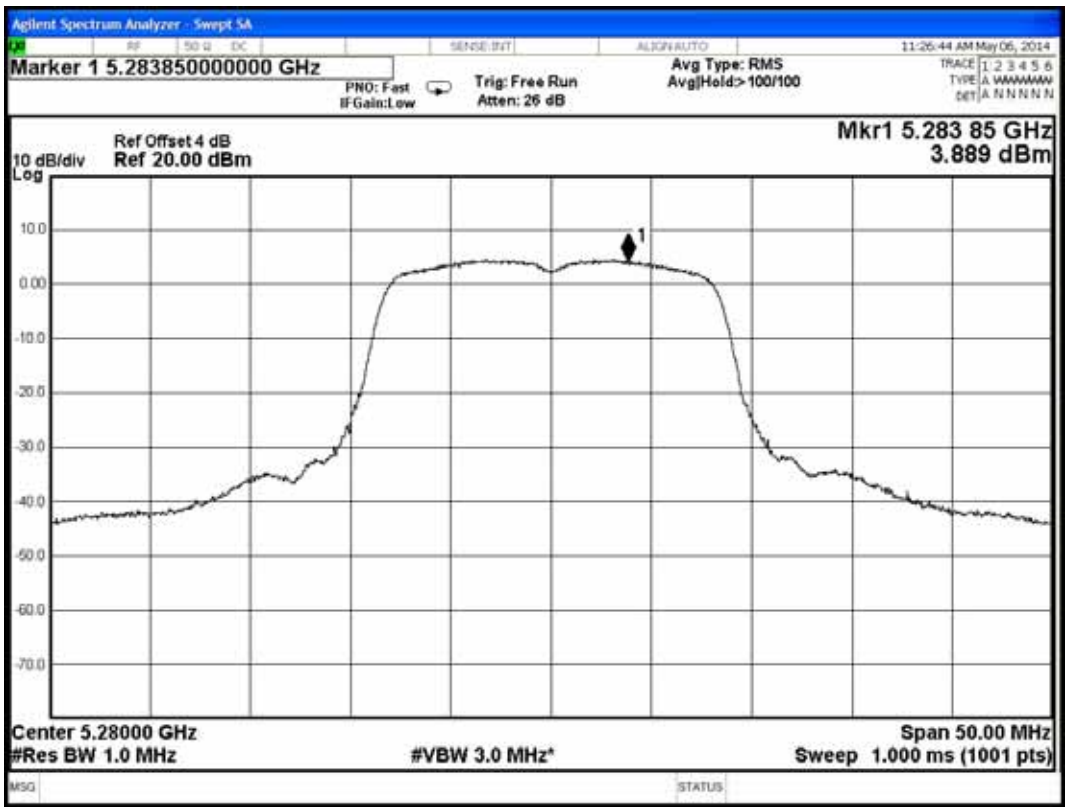
802.11a (UNII Band I), Frequency: 5240MHz



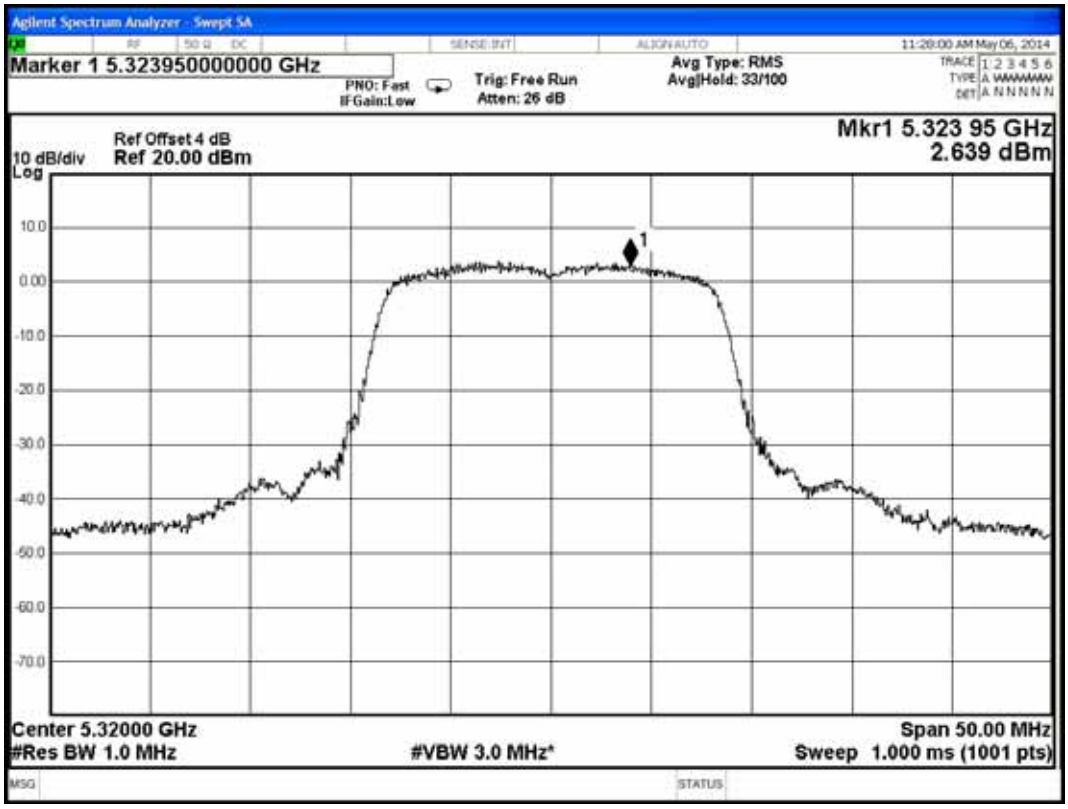
802.11a (UNII Band II-2A), Frequency: 5260MHz



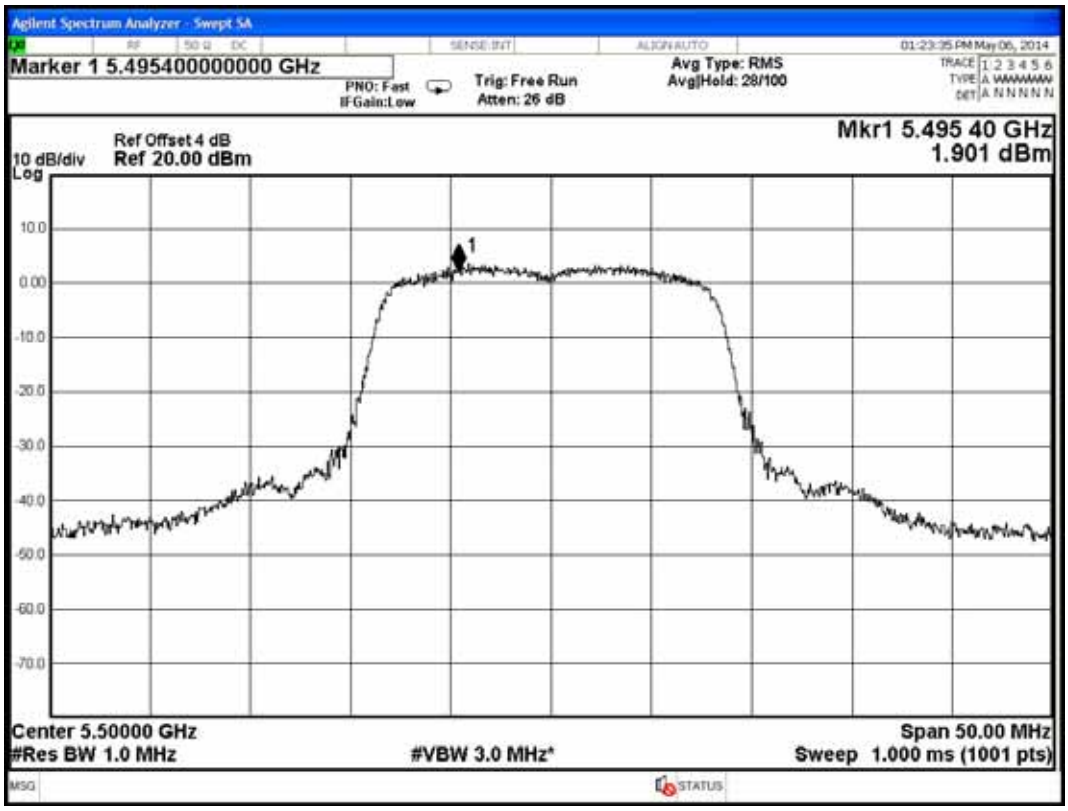
802.11a (UNII Band II-2A), Frequency: 5280MHz



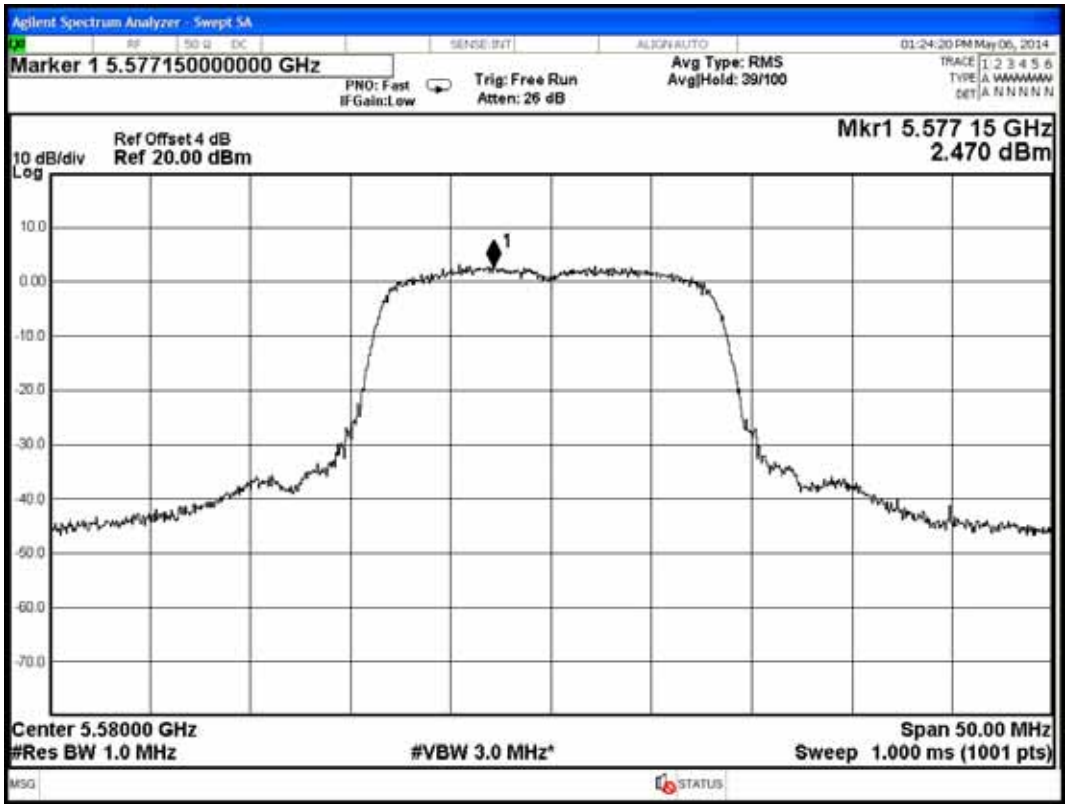
802.11a (UNII Band II-2A), Frequency: 5320MHz



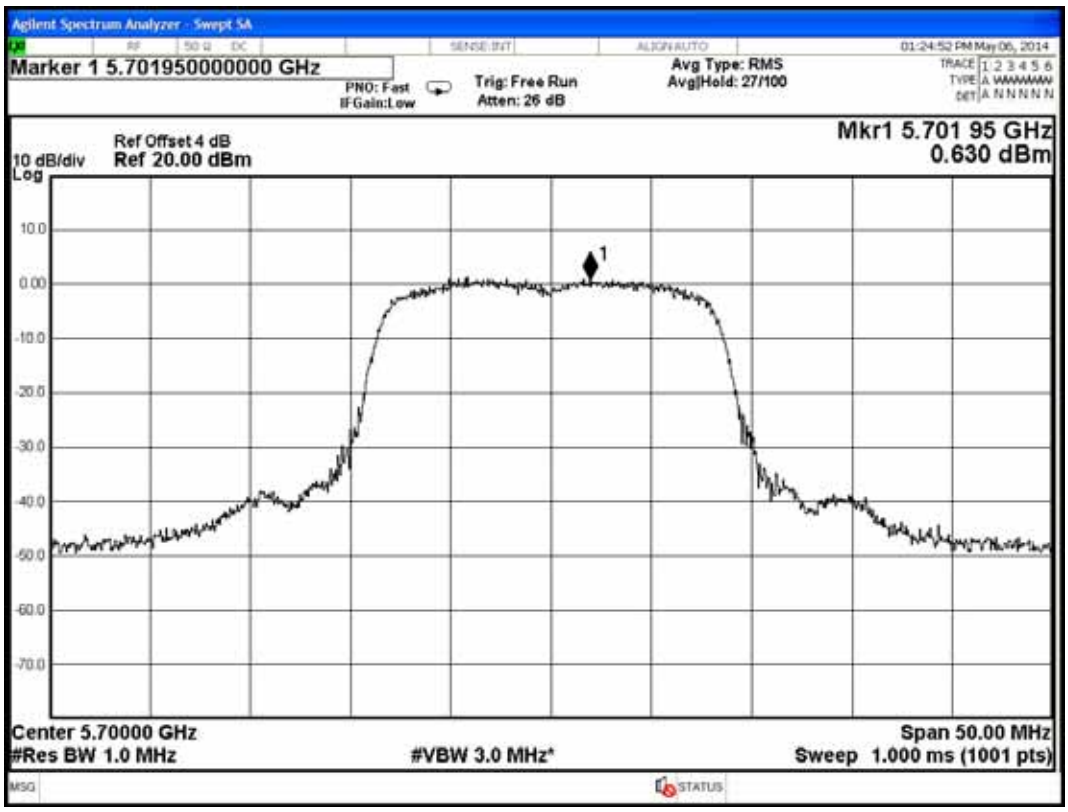
802.11a (UNII Band II-2C), Frequency: 5500MHz



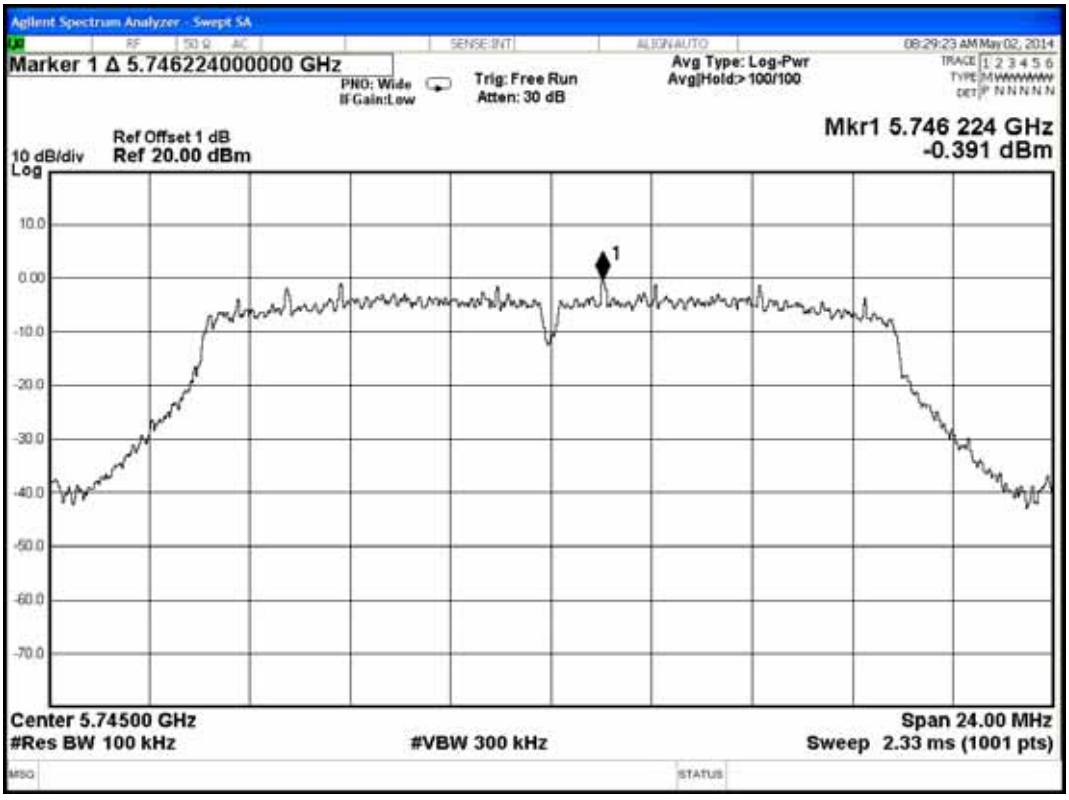
802.11a (UNII Band II-2C), Frequency: 5580MHz



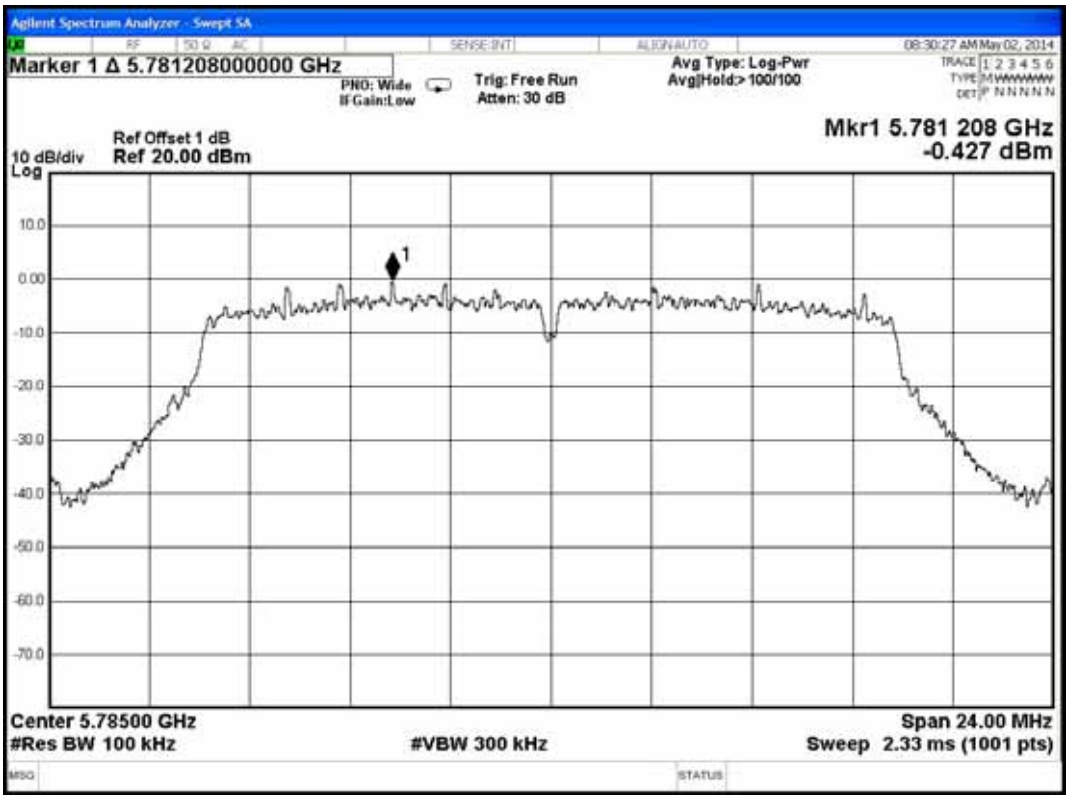
802.11a (UNII Band II-2C), Frequency: 5700MHz



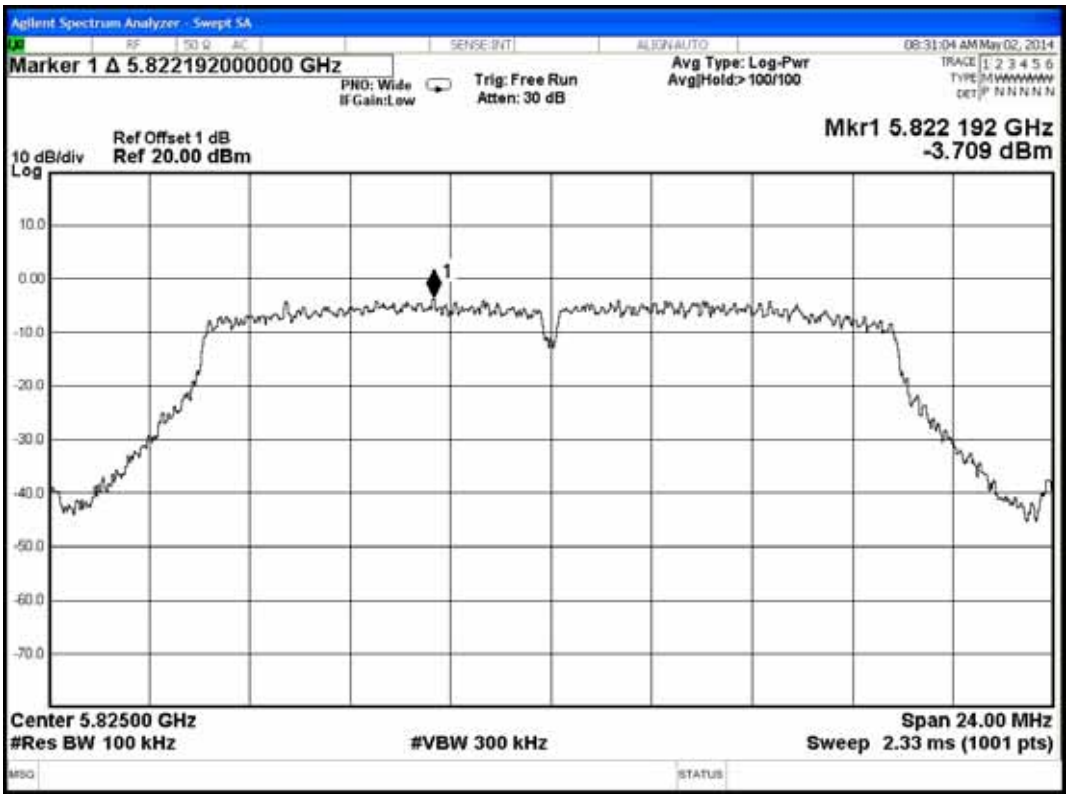
802.11a (UNII Band III), Frequency: 5745MHz



802.11a (UNII Band III), Frequency: 5785MHz



802.11a (UNII Band III), Frequency: 5825MHz



7.6.2. For 802.11n-HT20

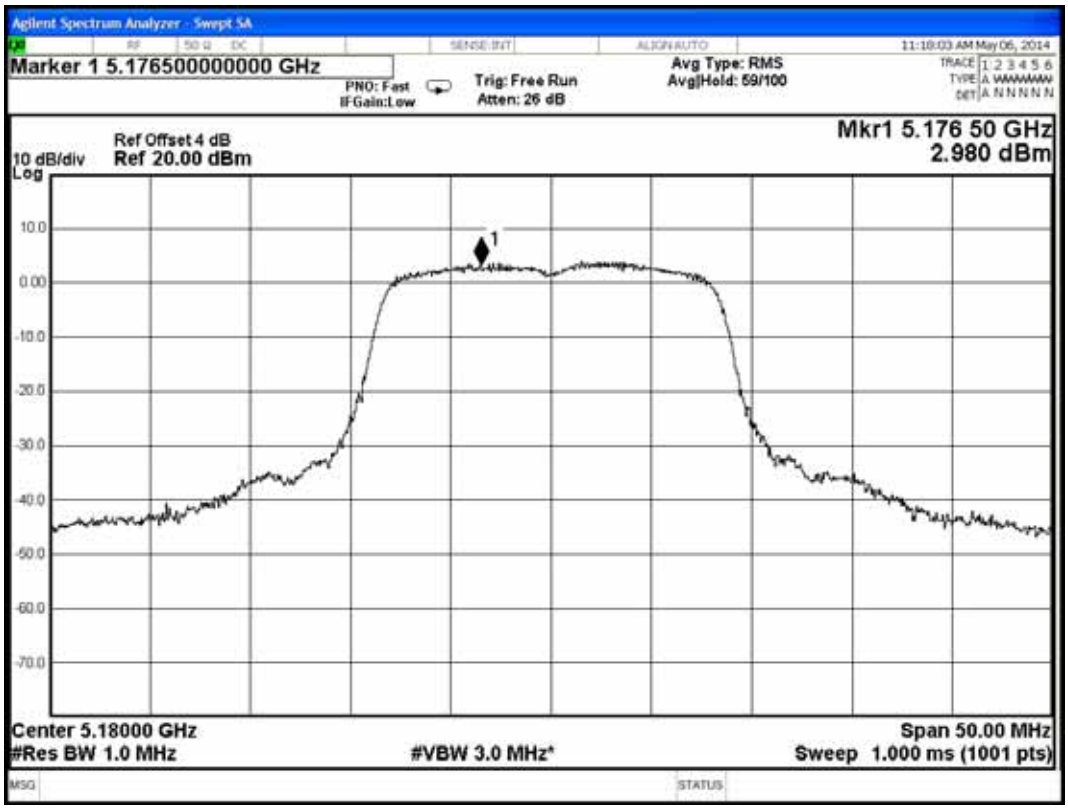
Mode	UNII Band	Channel	Frequency	**Power Spectral Density (dBm)**	**Limit (dBm)**
1.	UNII Band I	CH 36	5180MHz	**2.980**	**4**
2.		CH 40	5200MHz	**3.538**	**4**
3.		CH 48	5240MHz	**3.435**	**4**
4.	UNII Band II-2A	CH 52	5260MHz	**3.122**	**11**
5.		CH 56	5280MHz	**3.152**	**11**
6.		CH 64	5320MHz	**3.441**	**11**
7.	UNII Band II-2C	CH 100	5500MHz	**1.085**	**11**
8.		CH 116	5580MHz	**1.970**	**11**
9.		CH 140	5700MHz	**-0.484**	**11**

Mode	UNII Band	Channel	Frequency	**Power Density (dBm/100kHz)**	**BWCF Factor 100kHz to 500kHz**	**Total Power Density**
10.	UNII Band III	CH 149	5745MHz	**-0.198**	**6.989**	**6.791**
11.		CH 157	5785MHz	**-0.498**		**6.491**
12.		CH 165	5825MHz	**-0.498**		**6.491**

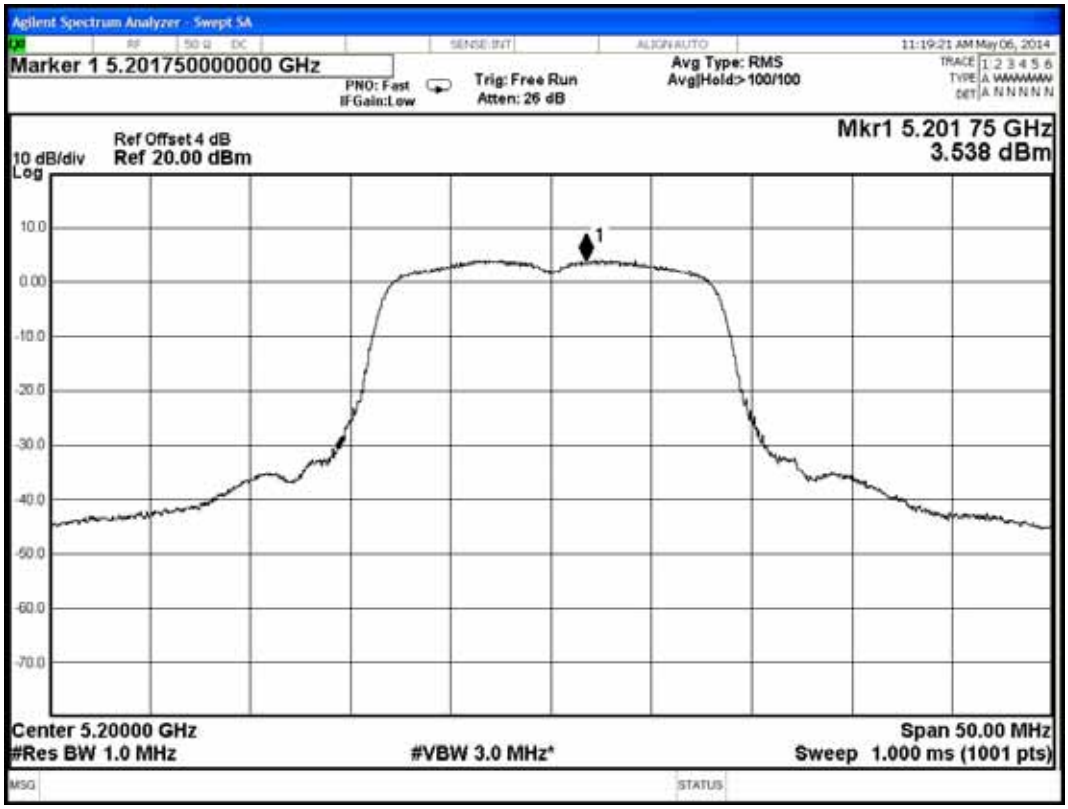
Limit: 30dBm

Note: 1. BCW Factor= 10 log (500/100)
2. Total Power Density= Power Density + BWCF Factor

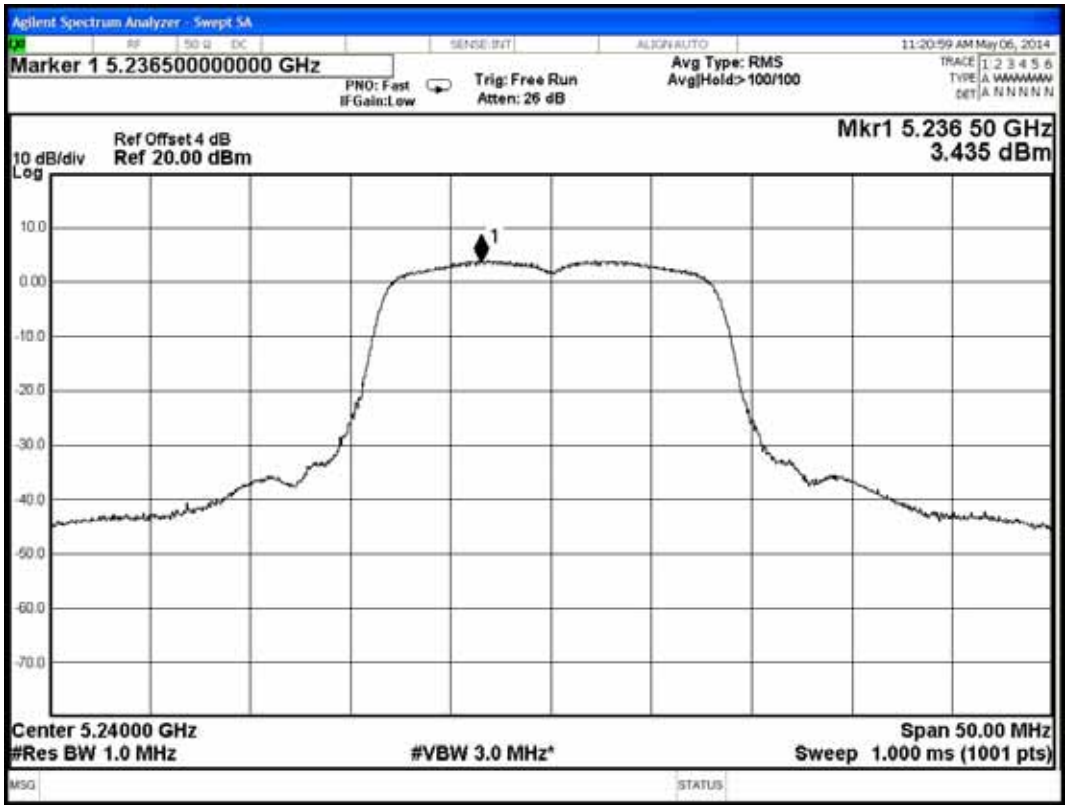
802.11n-HT20 (UNII Band I), Frequency: 5180MHz



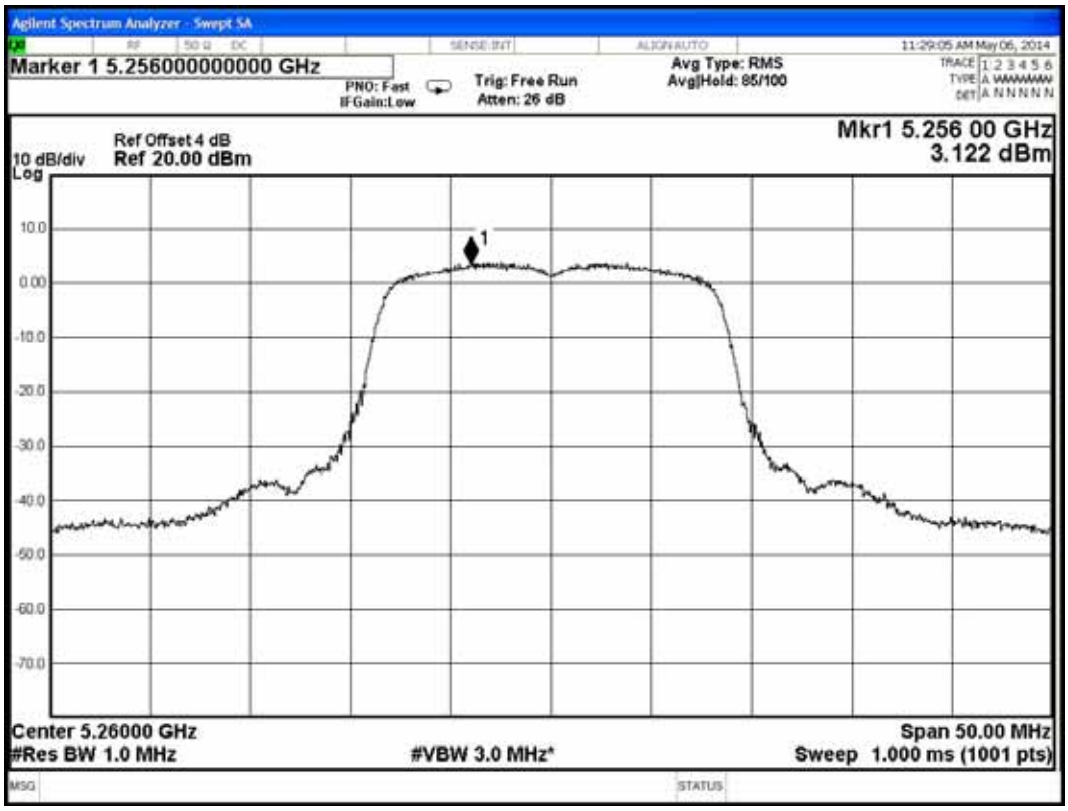
802.11n-HT20 (UNII Band I), Frequency: 5200MHz



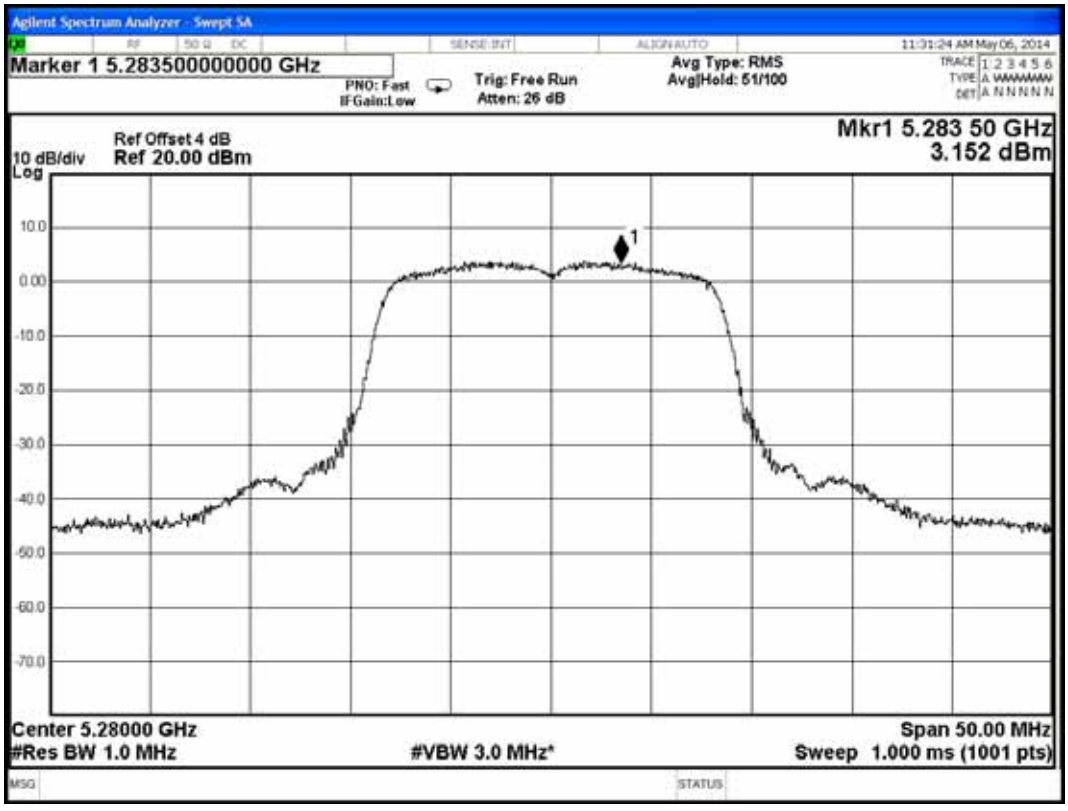
802.11n-HT20 (UNII Band I), Frequency: 5240MHz



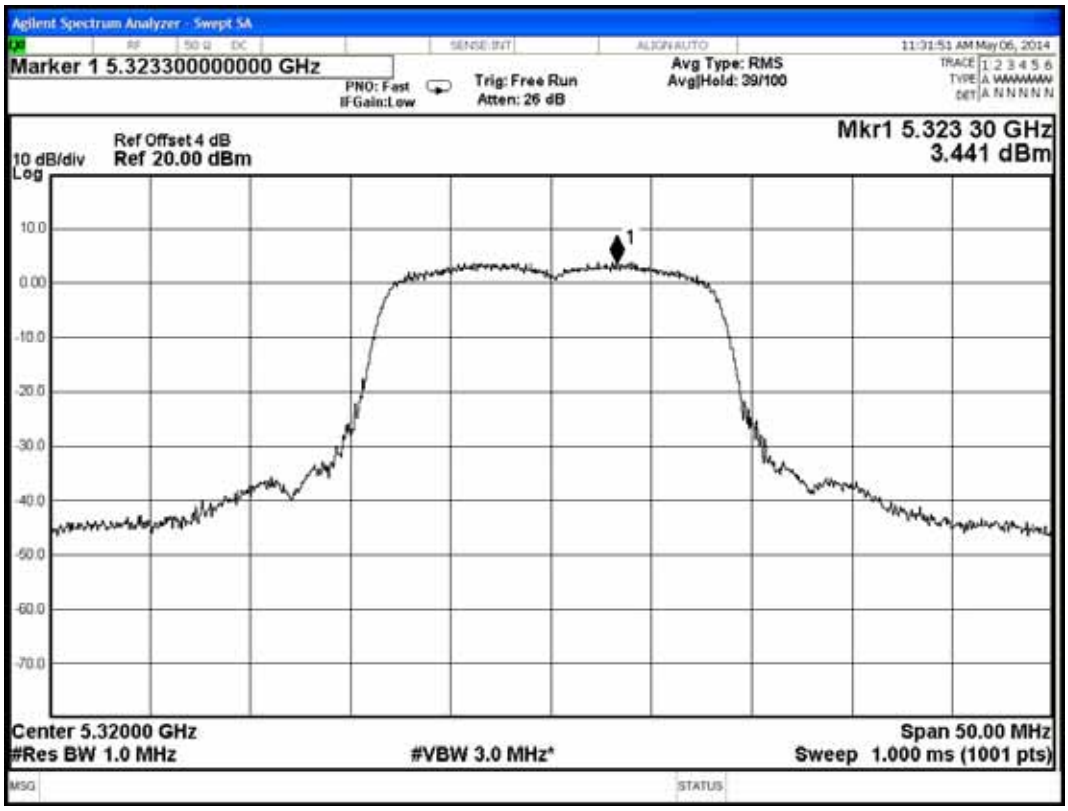
802.11n-HT20 (UNII Band II-2A), Frequency: 5260MHz



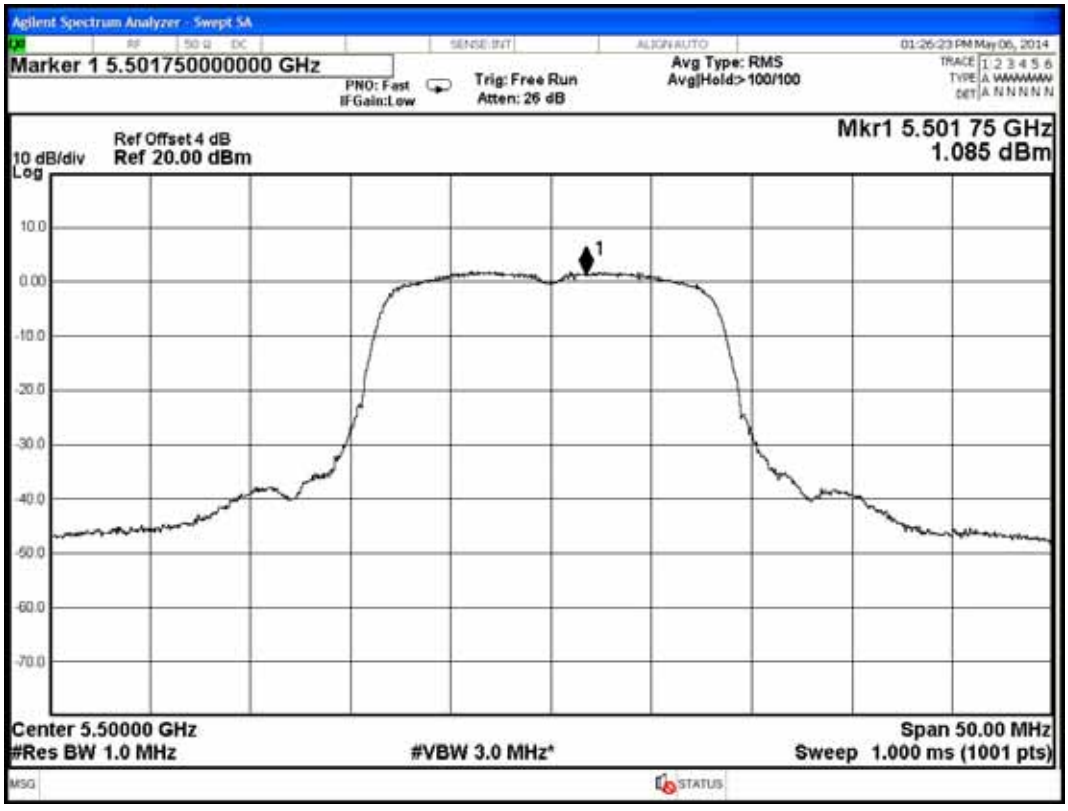
802.11n-HT20 (UNII Band II-2A), Frequency: 5280MHz



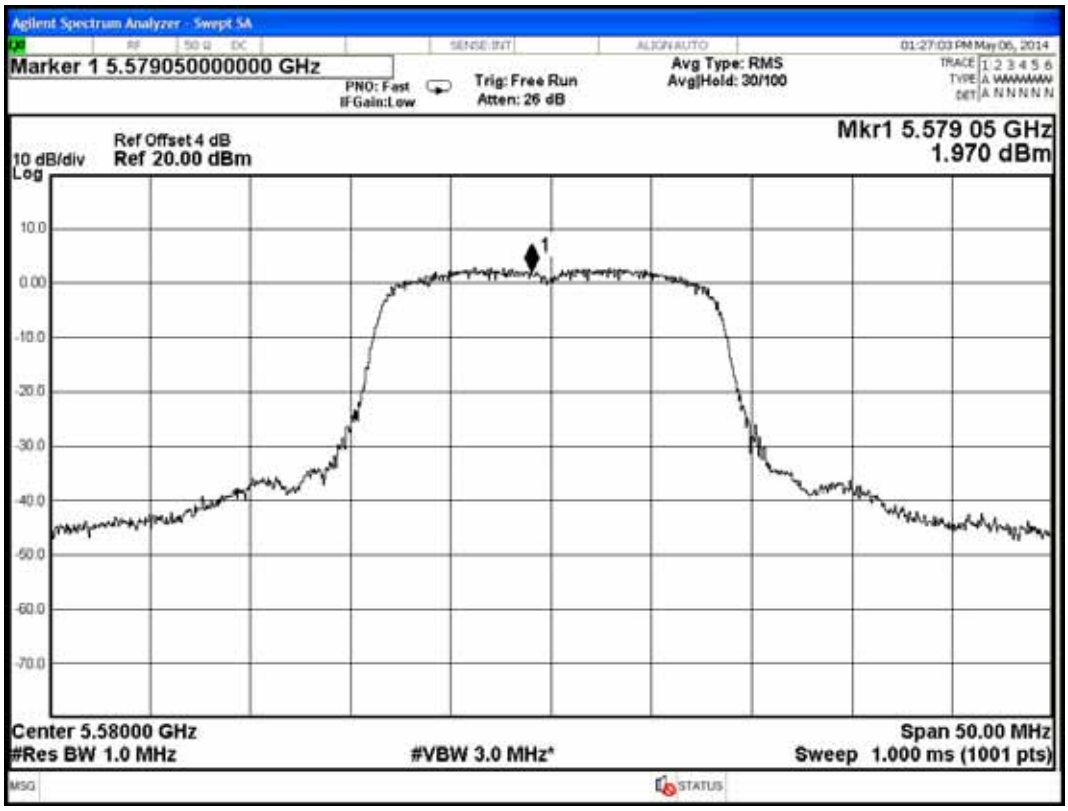
802.11n-HT20 (UNII Band II-2A), Frequency: 5320MHz



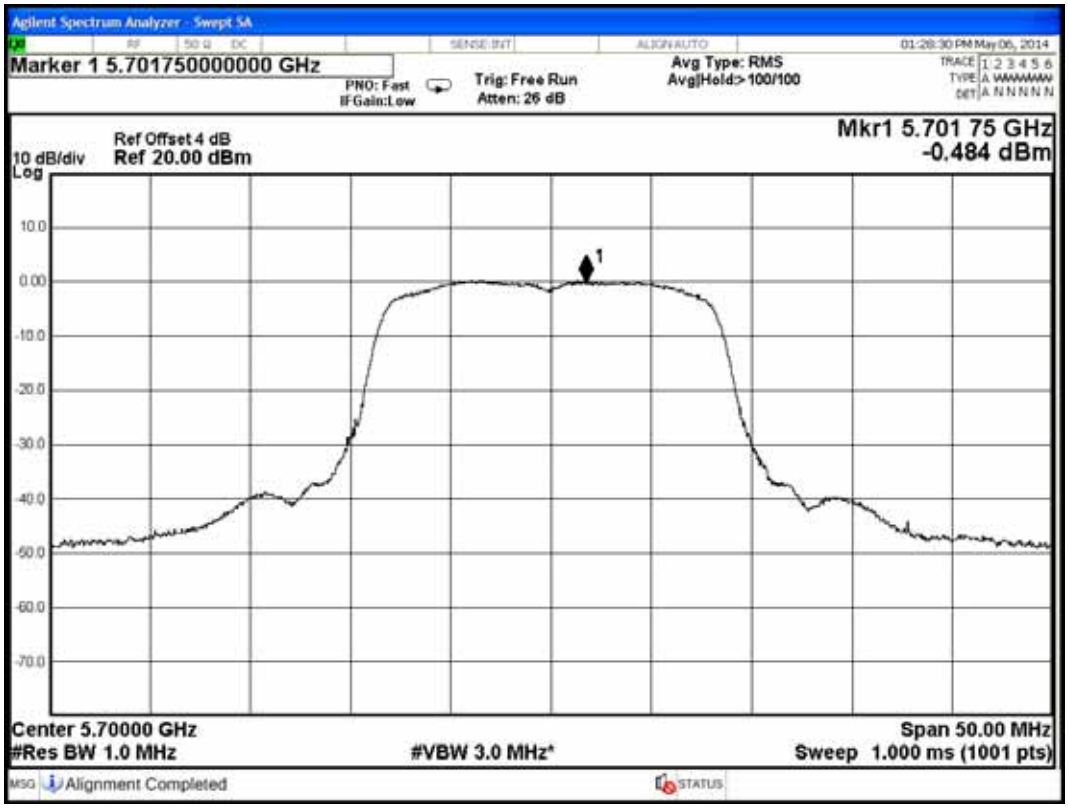
802.11n-HT20 (UNII Band II-2C), Frequency: 5500MHz



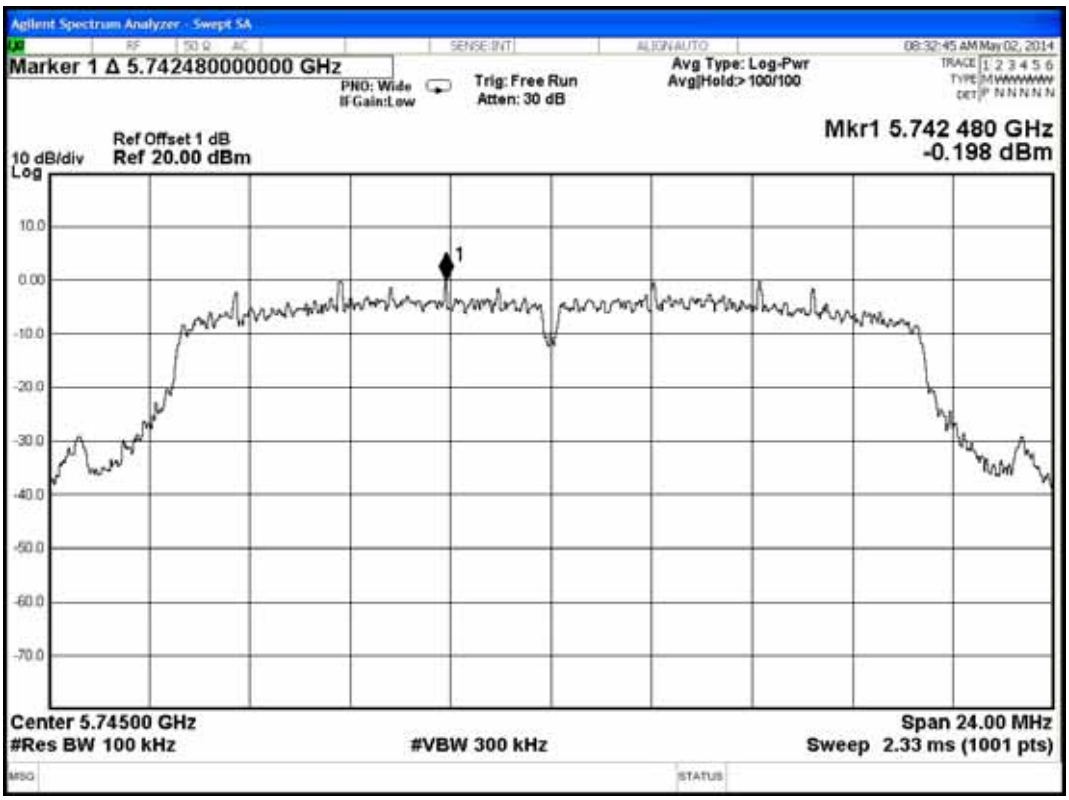
802.11n-HT20 (UNII Band II-2C), Frequency: 5580MHz



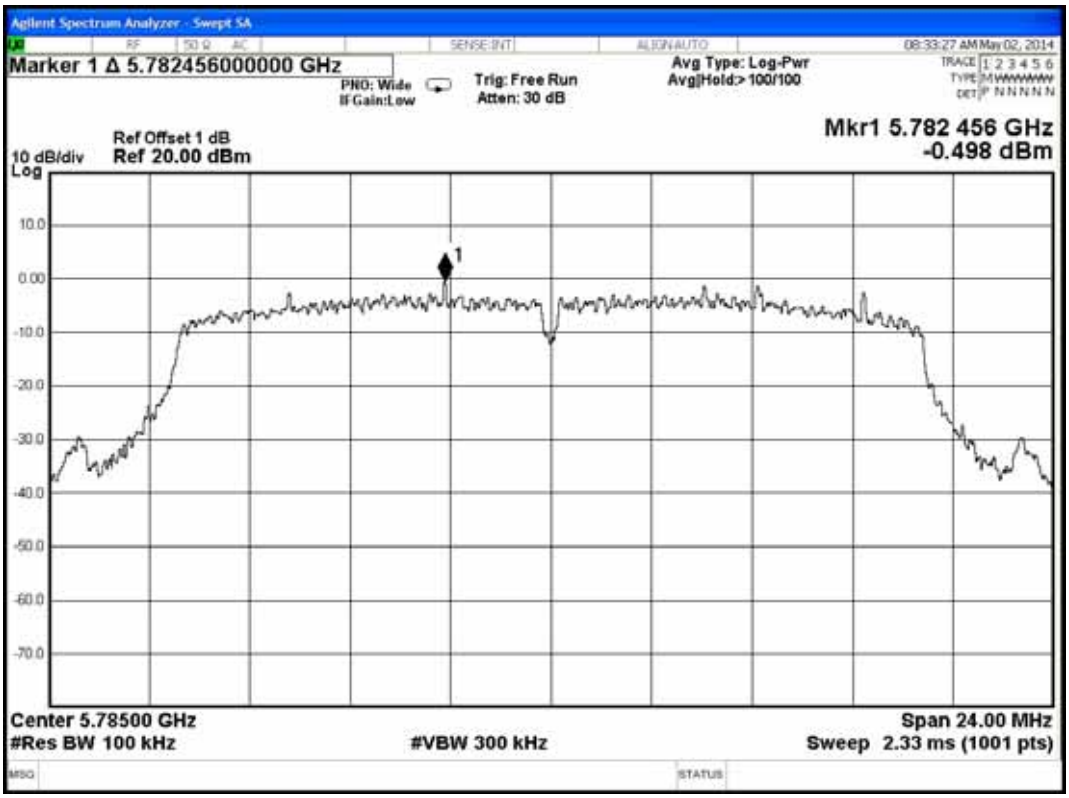
802.11n-HT20 (UNII Band II-2C), Frequency: 5700MHz



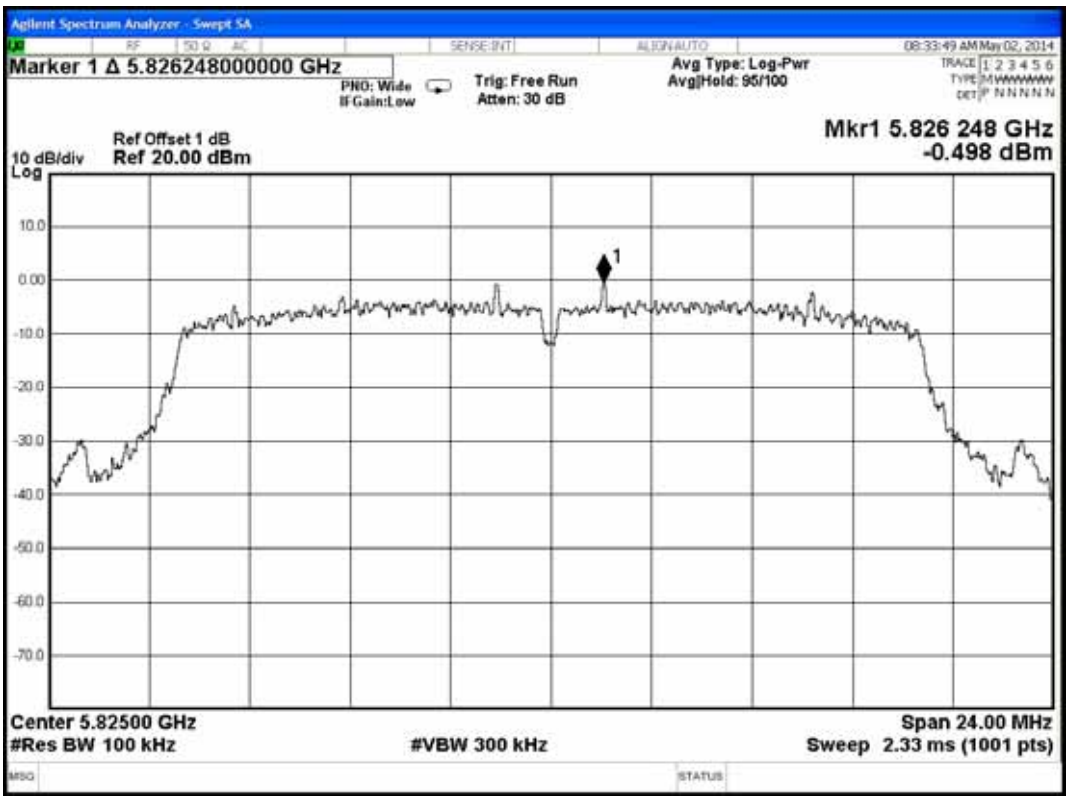
802.11n-HT20 (UNII Band III), Frequency: 5745MHz



802.11n-HT20 (UNII Band III), Frequency: 5785MHz



802.11n-HT20 (UNII Band III), Frequency: 5825MHz



7.6.3. For 802.11n-HT40

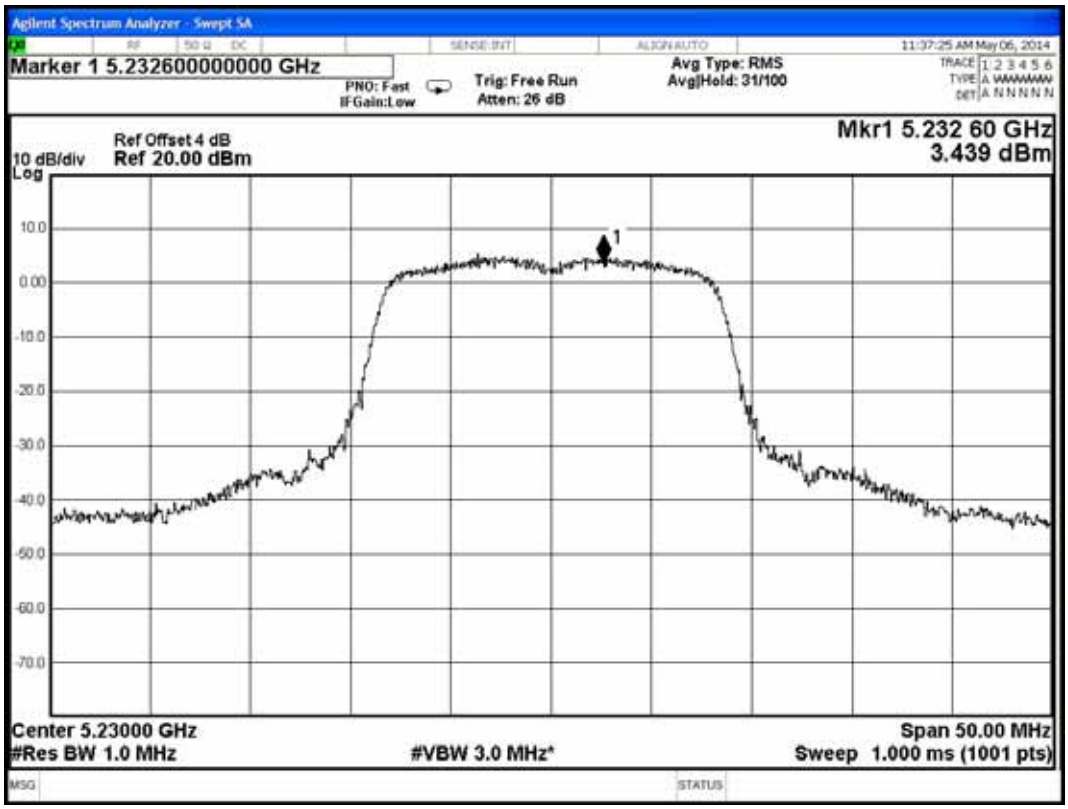
Mode	UNII Band	Channel	Frequency	**Power Spectral Density (dBm)**	**Limit (dBm)**
1.	UNII Band I	CH 38	5190MHz	**3.439**	**4**
2.		CH 46	5230MHz	**3.072**	**4**
3.	UNII Band II-2A	CH 54	5270MHz	**1.073**	**11**
4.		CH 62	5310MHz	**-0.112**	**11**
5.	UNII Band II-2C	CH 100	5510MHz	**-0.904**	**11**
6.		CH 110	5550MHz	**0.059**	**11**
7.		CH 116	5670MHz	**-3.534**	**11**

Mode	UNII Band	Channel	Frequency	**Power Density (dBm/100kHz)**	**BWCF Factor 100kHz to 500kHz**	**Total Power Density**
10.	UNII Band III	CH 151	5755MHz	**-3.131**	**6.989**	**3.858**
11.		CH 159	5795MHz	**-3.422**		**3.567**

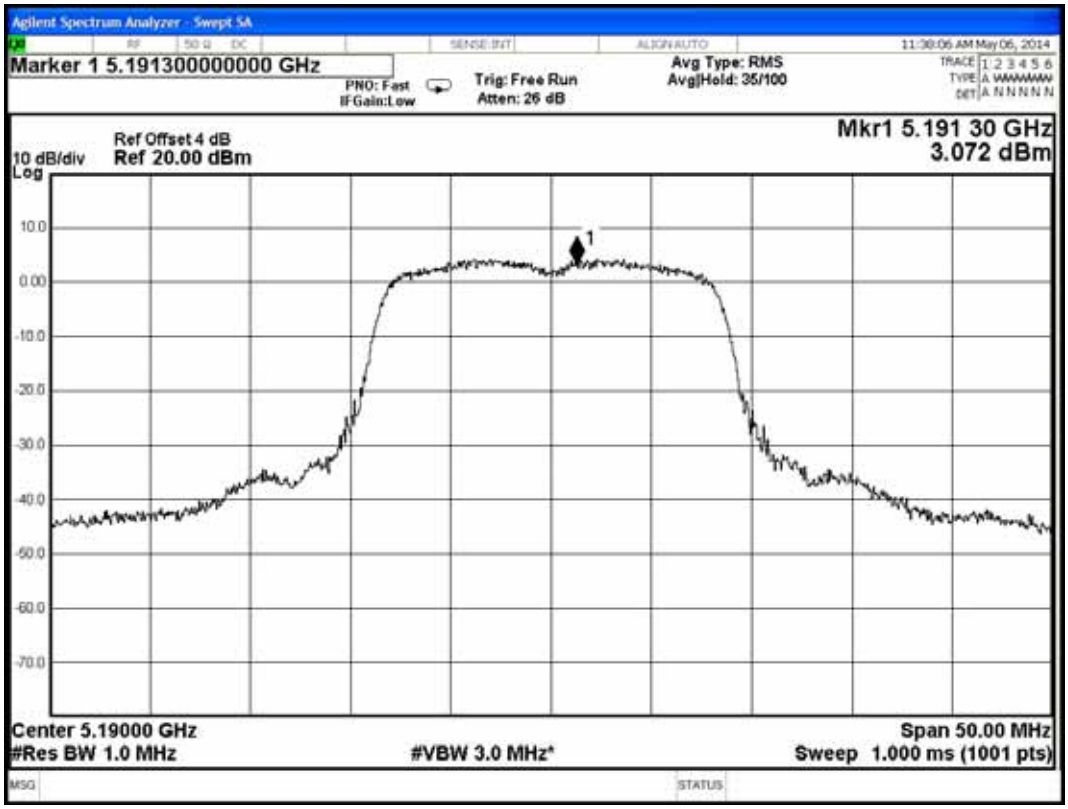
Limit: 30dBm

Note: 1. BCW Factor= 10 log (500/100)
2. Total Power Density= Power Density + BWCF Factor

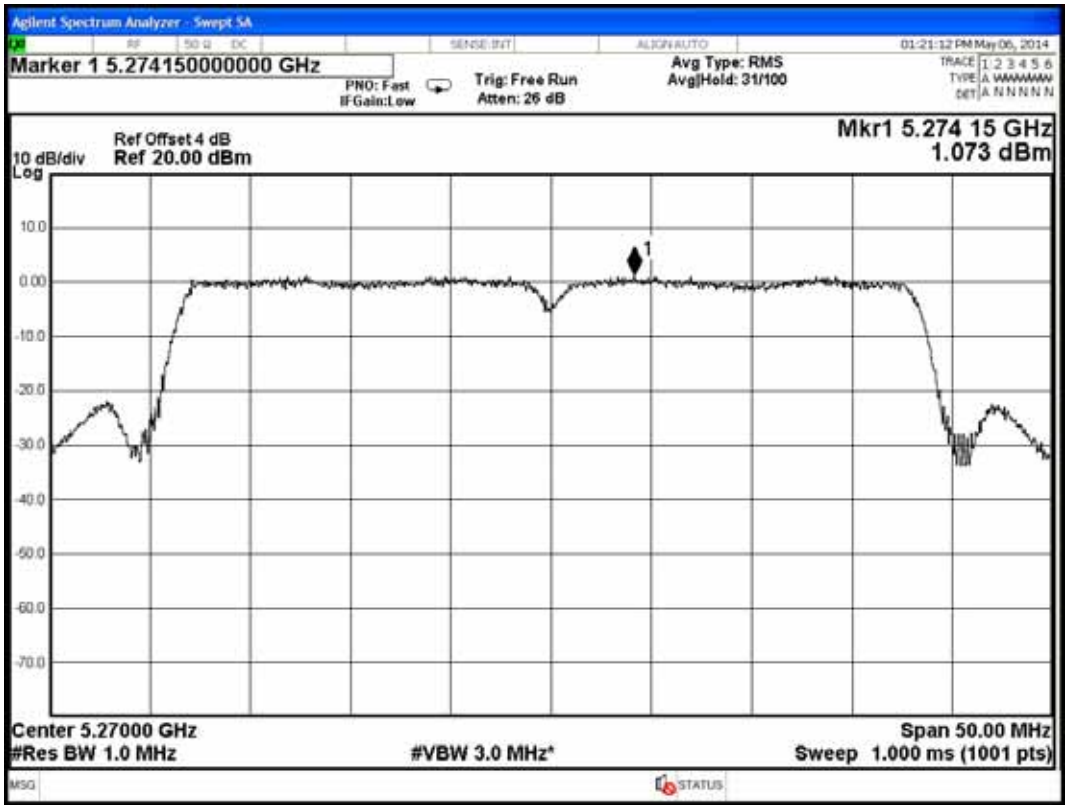
802.11n-HT40 (UNII Band I), Frequency: 5190MHz



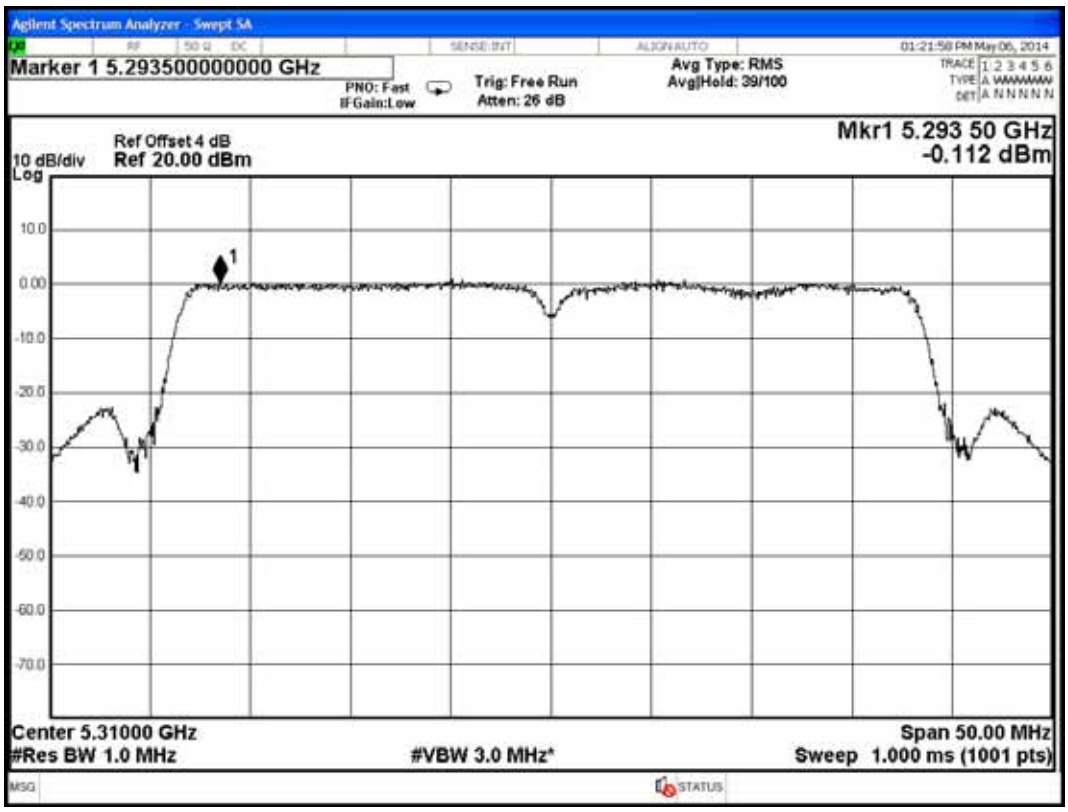
802.11n-HT40 (UNII Band I), Frequency: 5230MHz



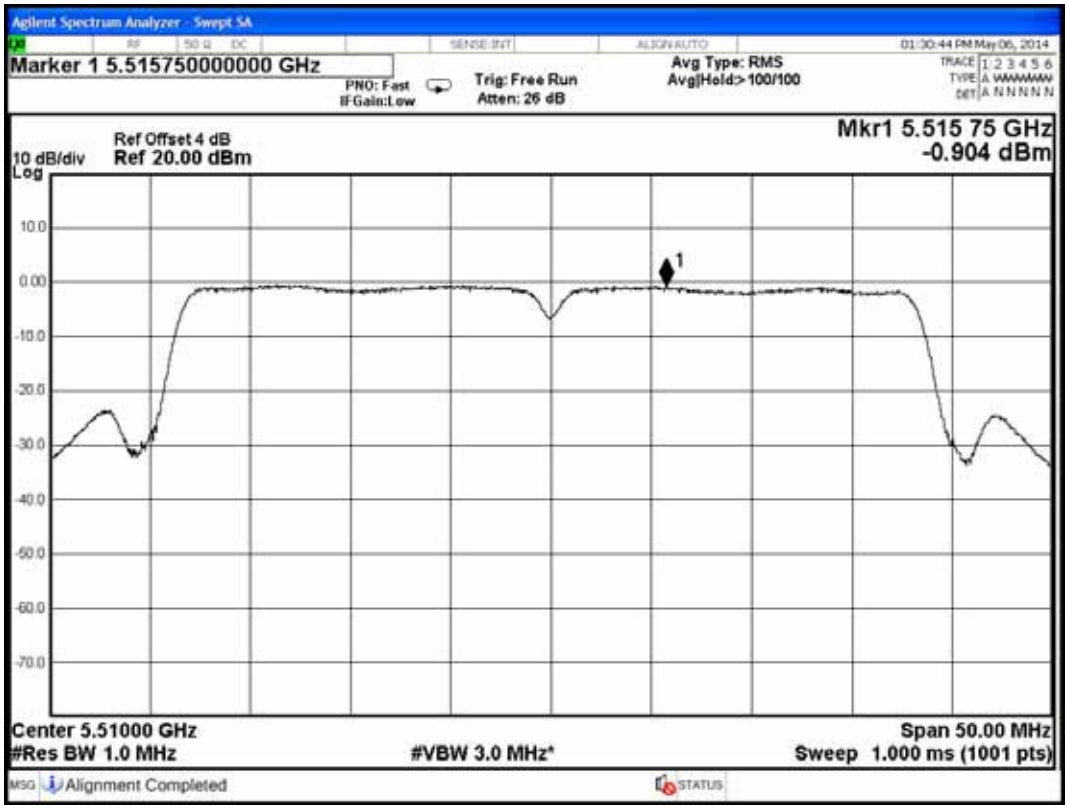
802.11n-HT40 (UNII Band II-2A), Frequency: 5270MHz



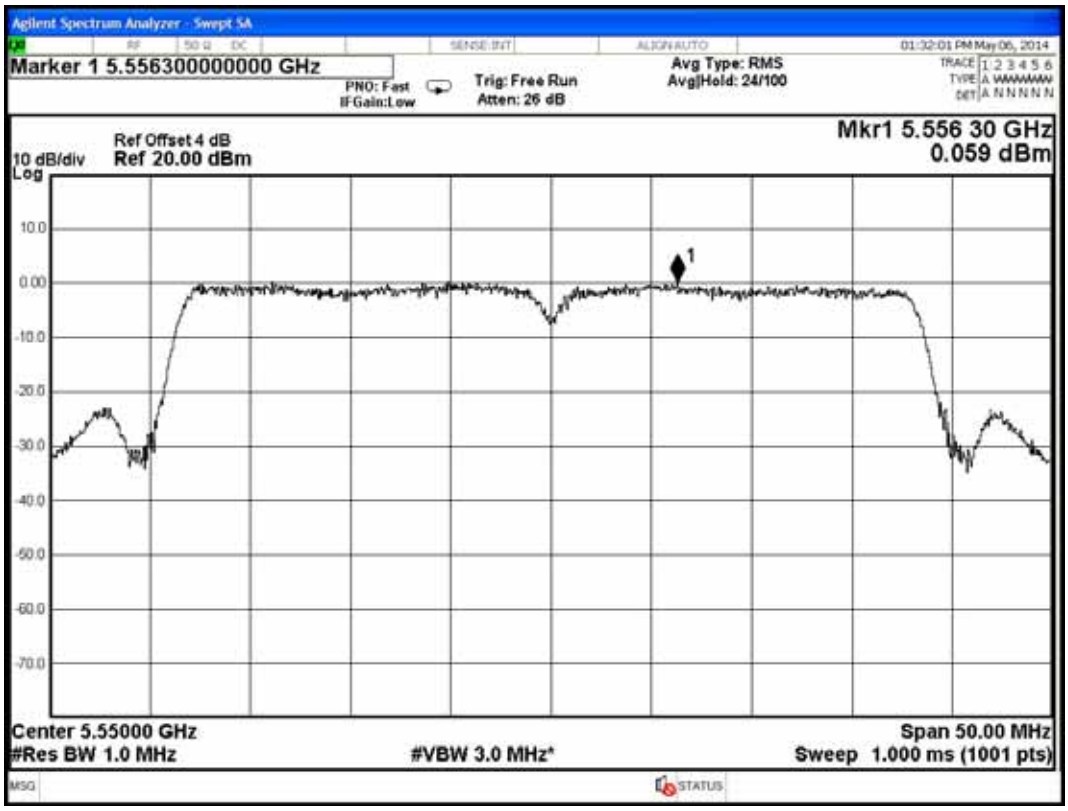
802.11n-HT40 (UNII Band II-2A), Frequency: 5310MHz



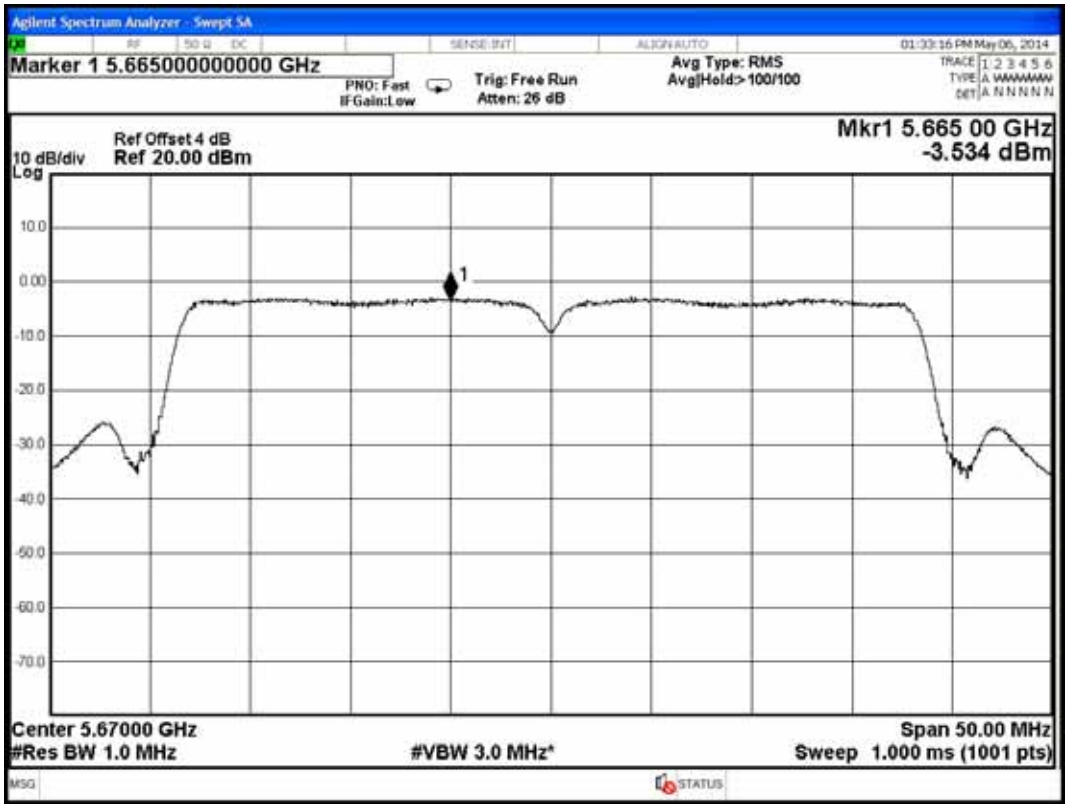
802.11n-HT40 (UNII Band II-2C), Frequency: 5510MHz



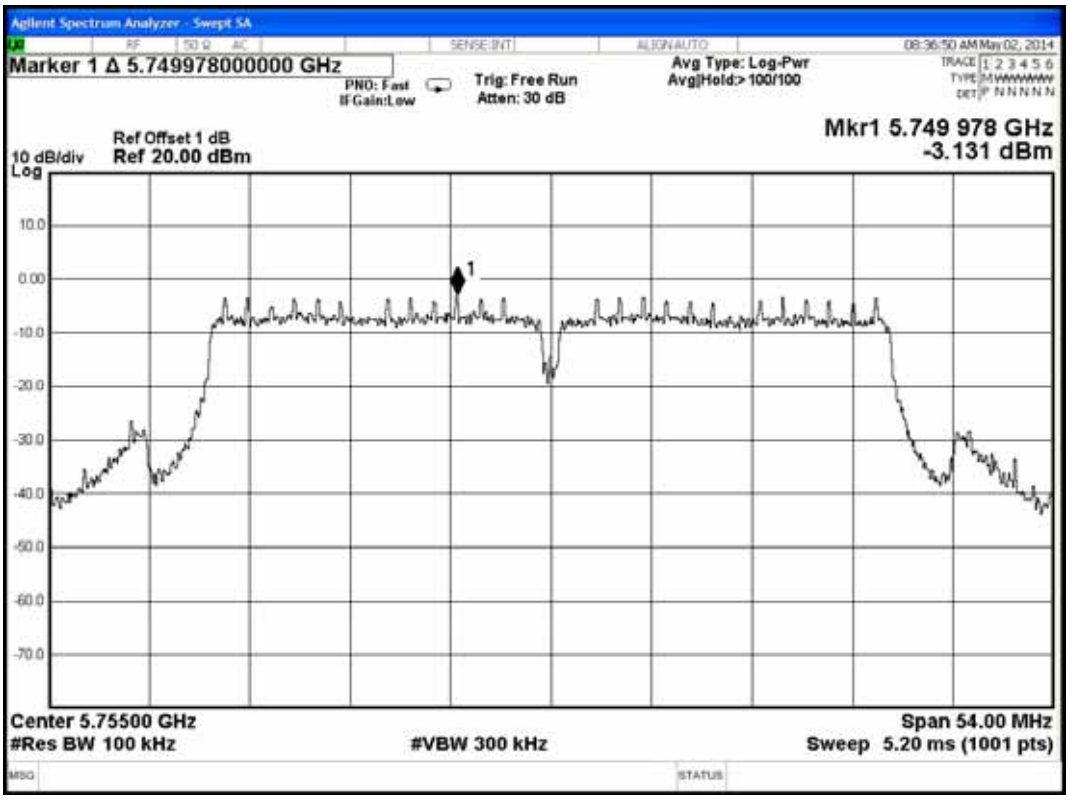
802.11n-HT40 (UNII Band II-2C), Frequency: 5550MHz



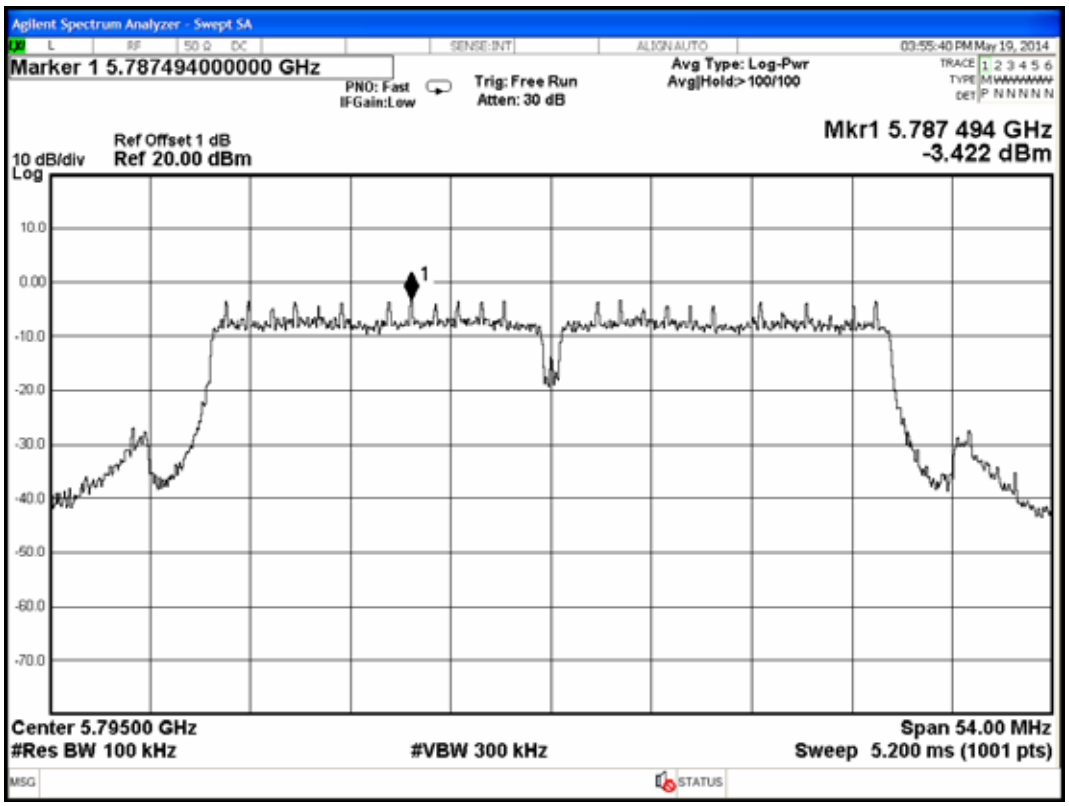
802.11n-HT40 (UNII Band II-2C), Frequency: 5670MHz



802.11n-HT40 (UNII Band III), Frequency: 5755MHz



802.11n-HT40 (UNII Band III), Frequency: 5795MHz



8. PEAK POWER EXCURSION MEASUREMENT

8.1. Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 17, 12'	Oct. 16, 13'

8.2. Block Diagram of Test Setup

The same as section.4.2.

8.3. Specification Limits (§15.407(a)-(6))

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13dB across any 1MHz bandwidth or the emission bandwidth whichever is less.

8.4. Operating Condition of EUT

The test program "WL command" was used to enable the EUT to transmit data at different channel frequency individually.

8.5. Test Procedure

For 1st trace:
Find the maximum of the peak-max-hold spectrum.

1. Set RBW=1MHz
2. Set VBW≤3MHz
3. Detector=peak.
4. Trace mode=max-hold.
5. Allow the sweeps to continue until the trace stabilizes.
6. Use the peak serch function to find the peak of the spectrum.

For 2st trace:

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW=1MHz
3. Set VBW≥3MHz
4. Detector=RMS (i.e., power averaging), if available, Otherwise, use sample detector mode.
5. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
6. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.

The measurement guideline was according to KDB789033 D01 v01r03

Pursuant to KDB 662911, we executed conducted test for chain 0 as worse performance, and a factor 10log(N) shall be added, where N is the number of output.

8.6. Test Results

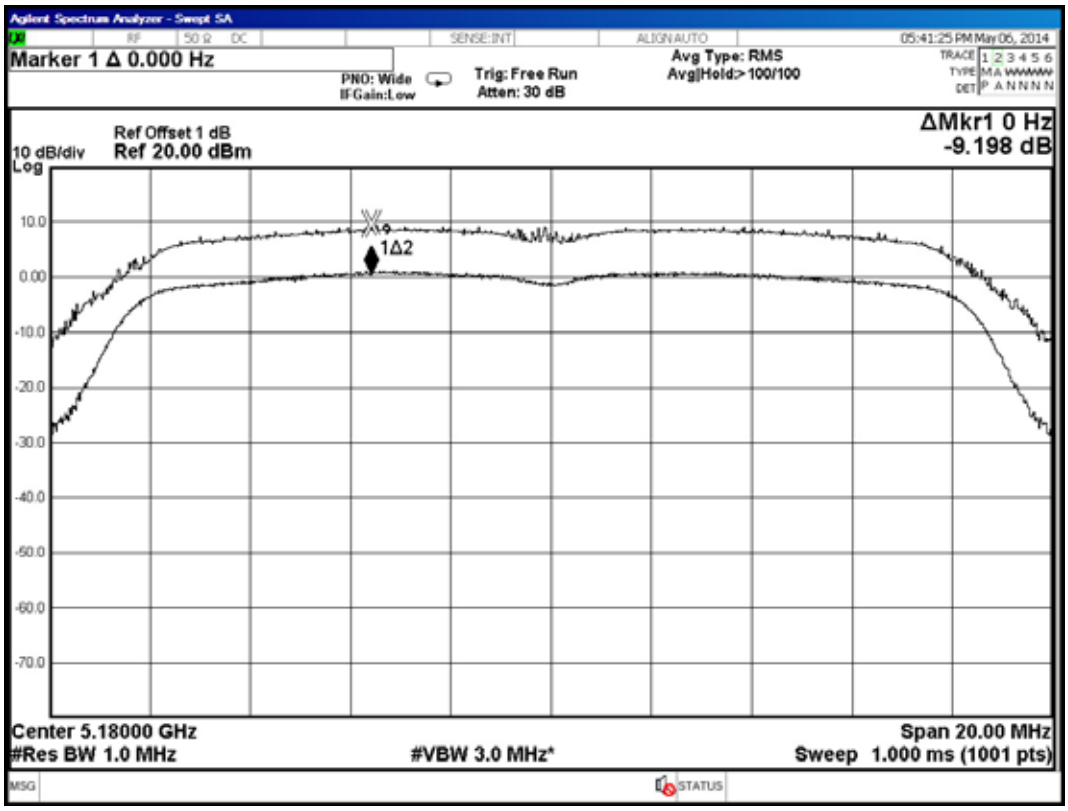
PASSED. All the test results are attached in next pages.

Test Date: 2014. 05. 06 Temperature: 23℃ Humidity: 48%

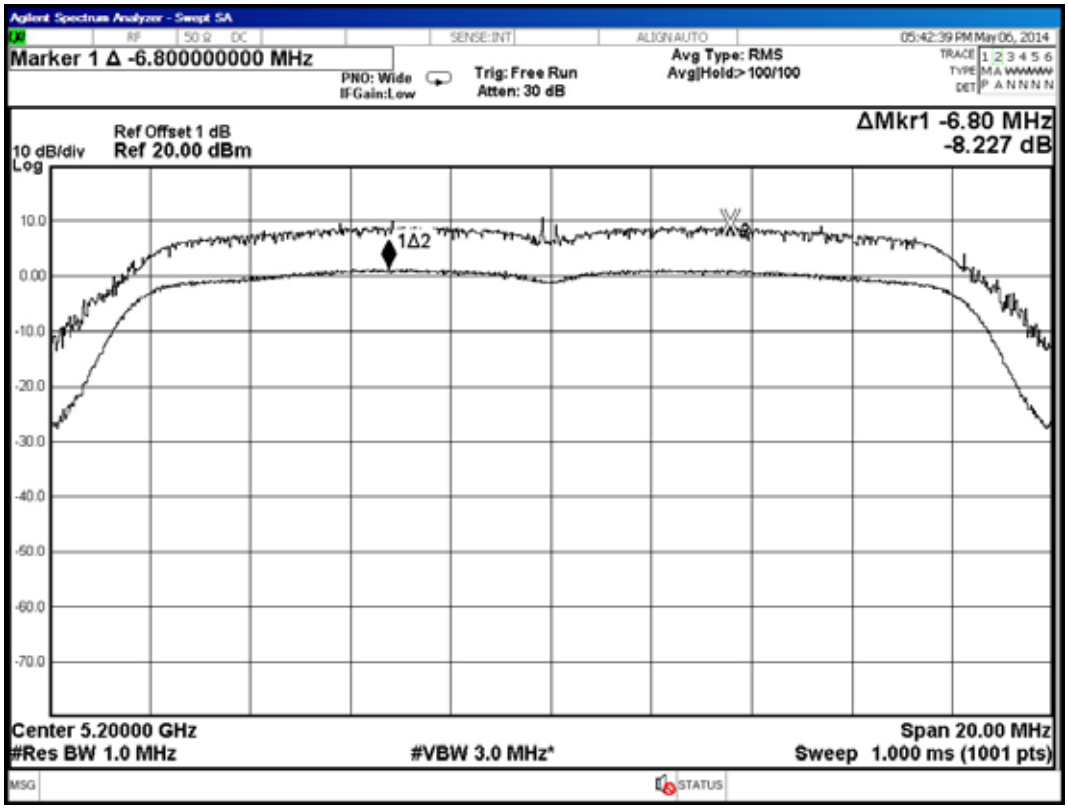
8.6.1. For 802.11a

Mode	UNII Band	Channel	Frequency	**Peak Power Excursion (dB)**	**Limit (dB)**
1.	UNII Band I	CH 36	5180MHz	**-9.198**	**13**
2.		CH 40	5200MHz	**-8.227**	**13**
3.		CH 48	5240MHz	**-10.095**	**13**
4.	UNII Band II	CH 52	5260MHz	**-8.183**	**13**
5.		CH 56	5280MHz	**-8.435**	**13**
6.		CH 64	5320MHz	**-8.729**	**13**
7.	UNII Band III	CH 100	5500MHz	**-8.499**	**13**
8.		CH 116	5580MHz	**-7.667**	**13**
9.		CH 140	5700MHz	**-8.592**	**13**

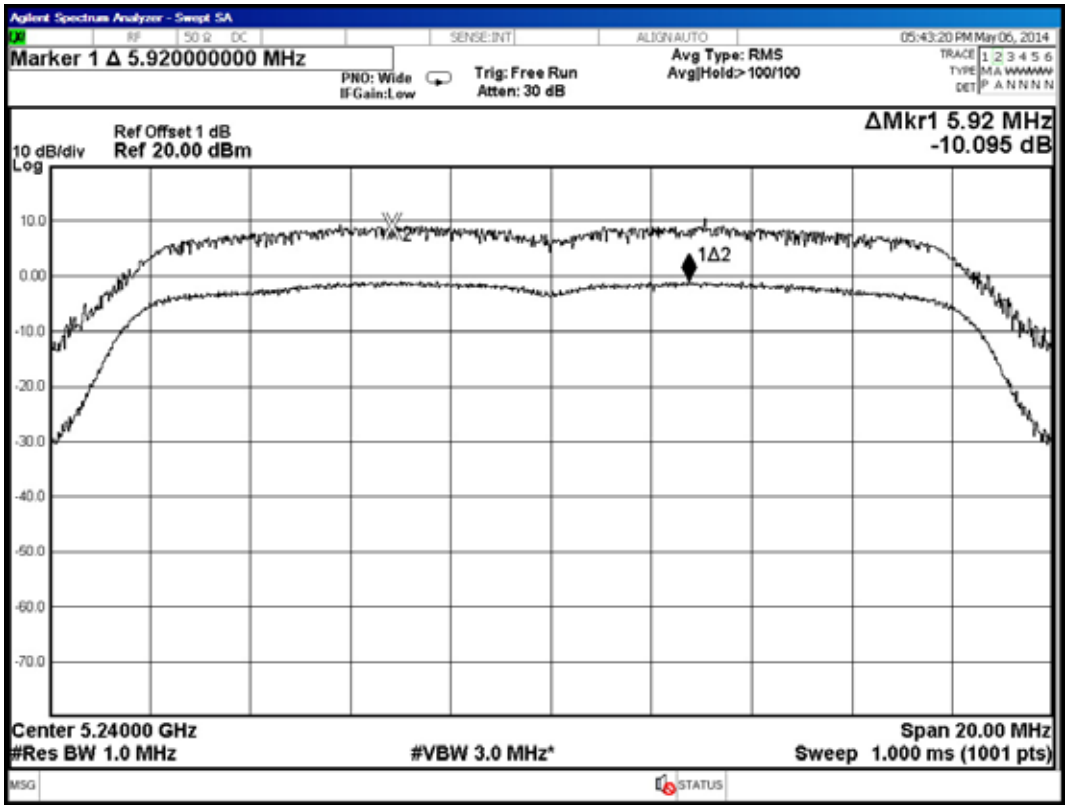
802.11a (UNII Band I), Frequency: 5180MHz



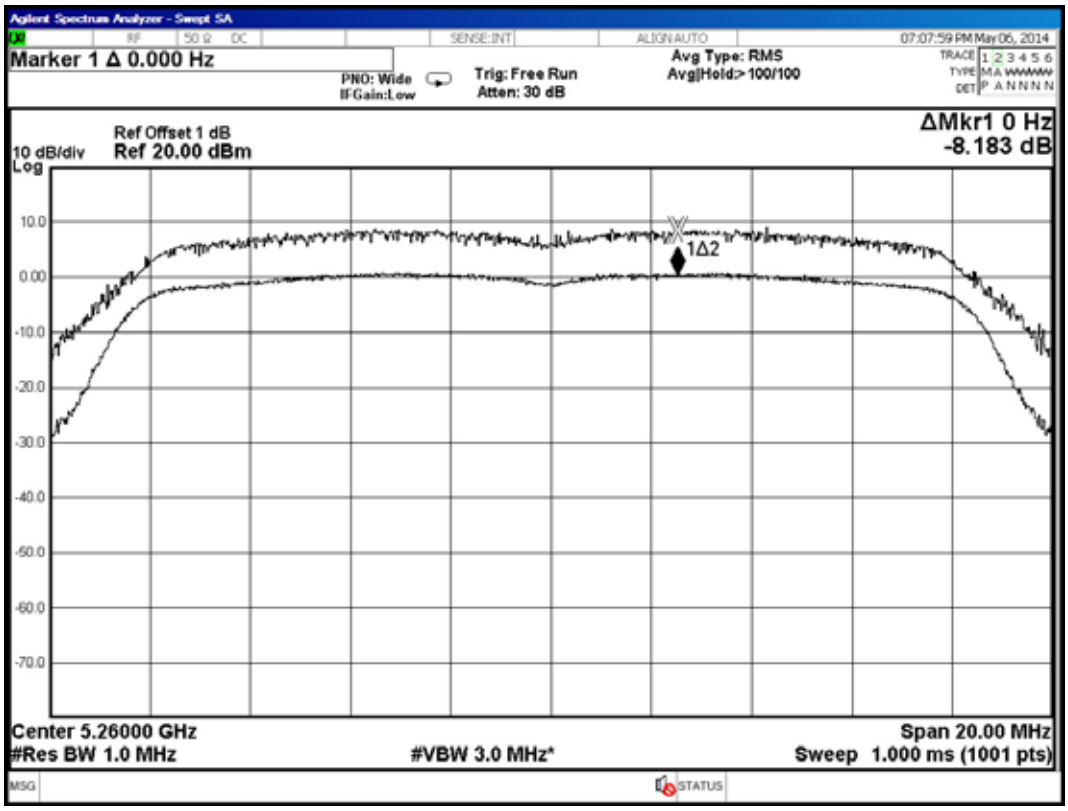
802.11a (UNII Band I), Frequency: 5200MHz



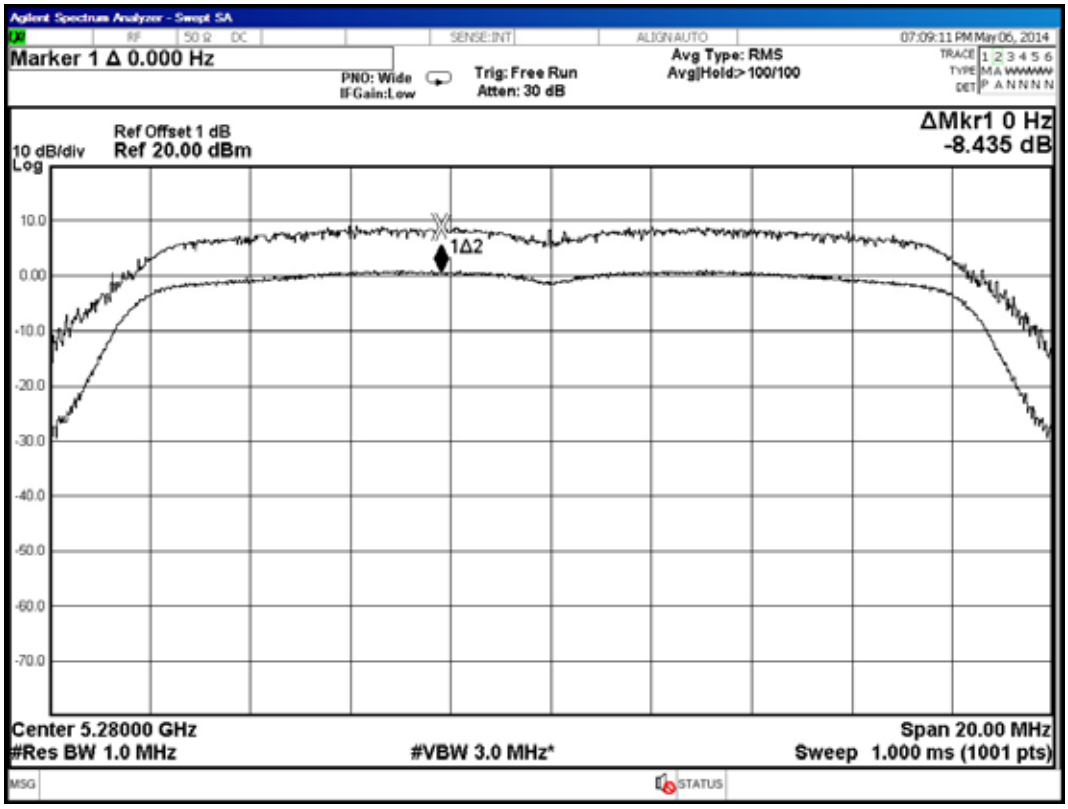
802.11a (UNII Band I), Frequency: 5240MHz



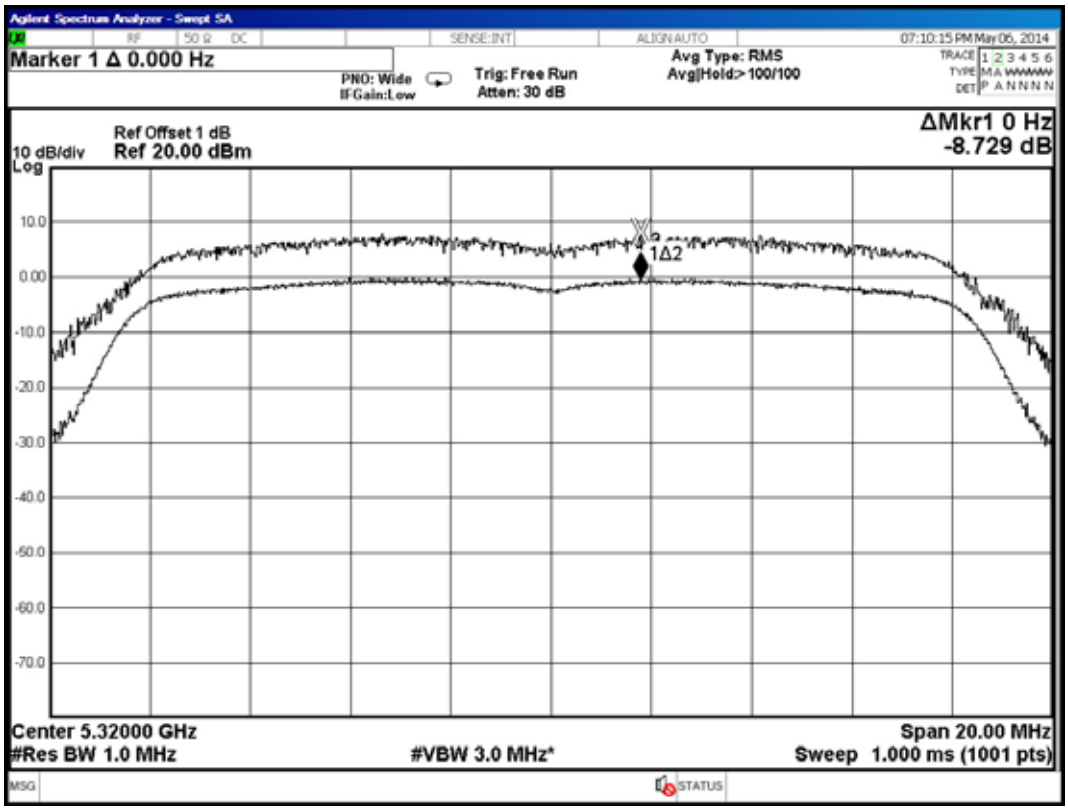
802.11a (UNII Band II), Frequency: 5260MHz



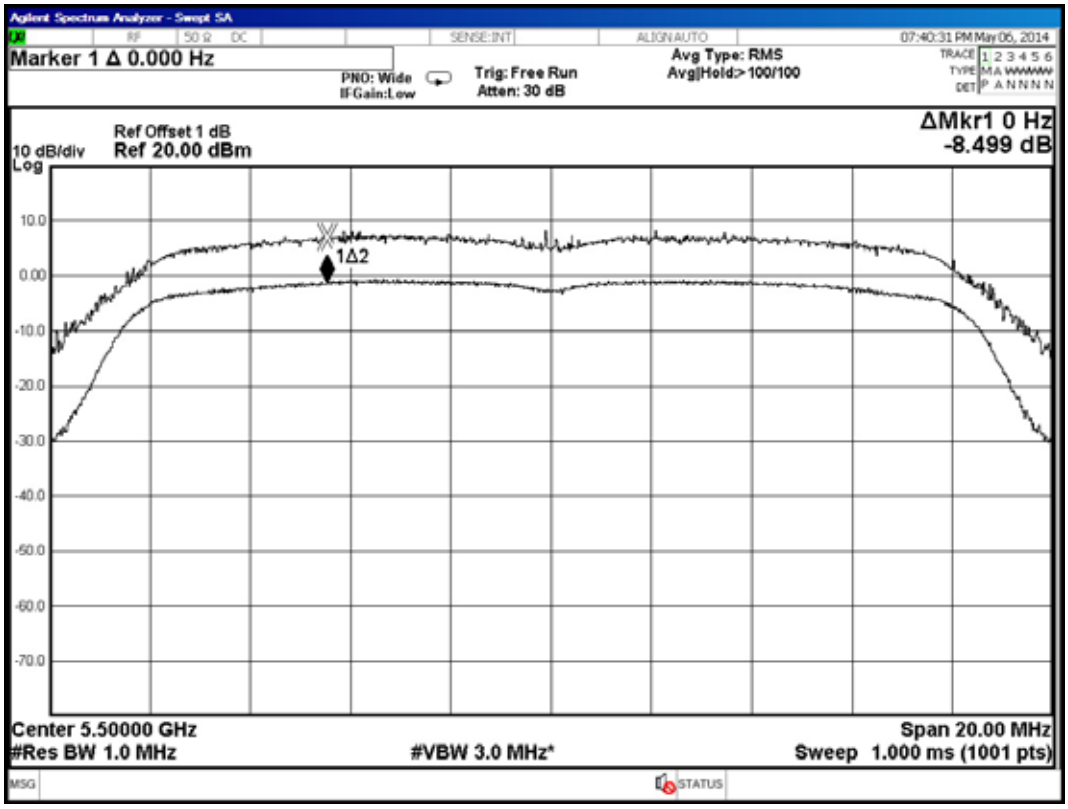
802.11a (UNII Band II), Frequency: 5280MHz



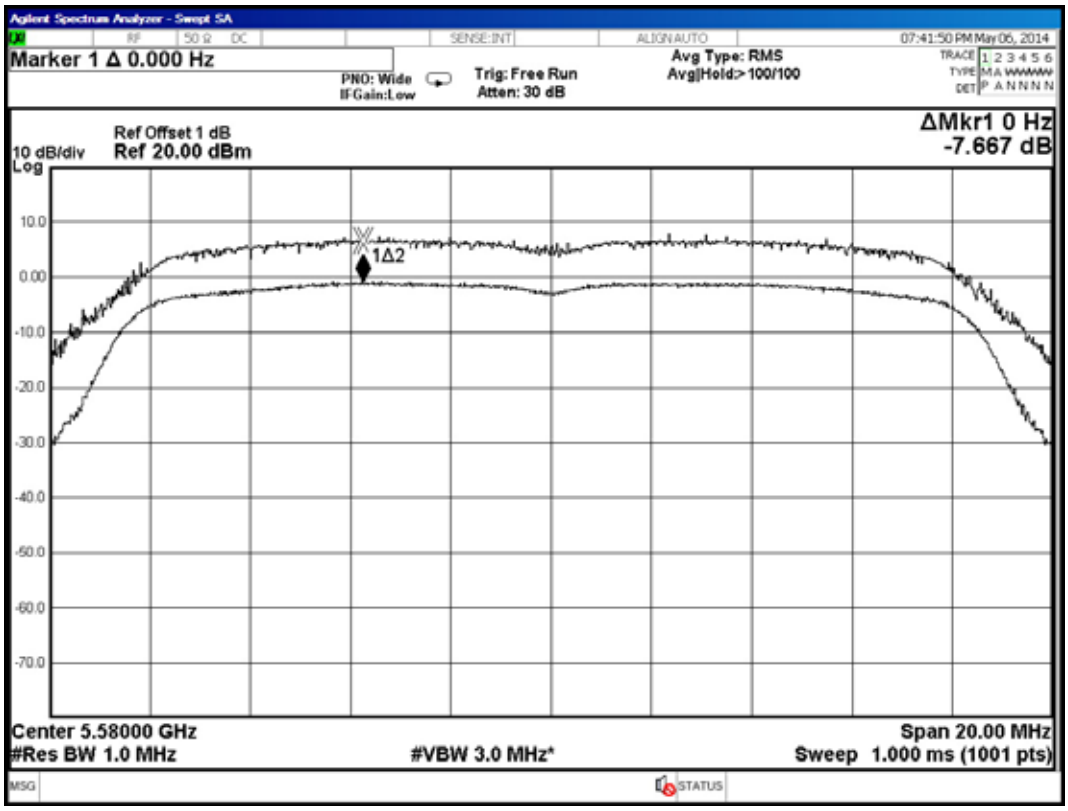
802.11a (UNII Band II), Frequency: 5320MHz



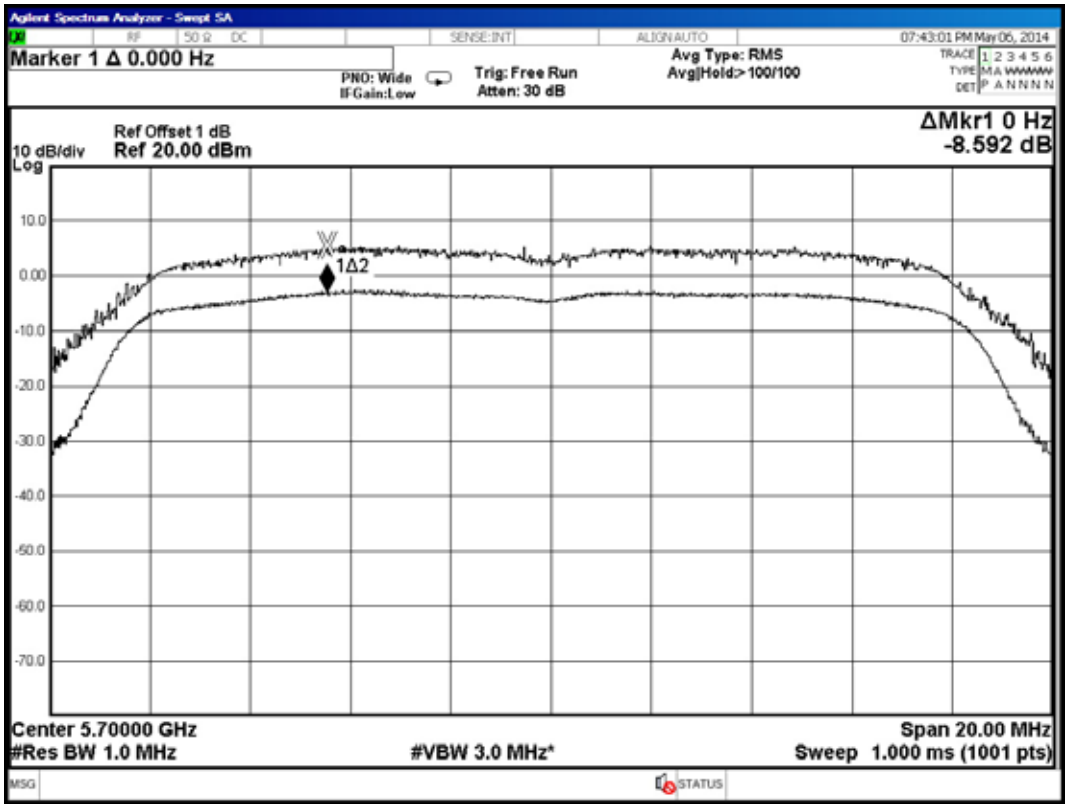
802.11a (UNII Band III), Frequency: 5500MHz



802.11a (UNII Band III), Frequency: 5580MHz



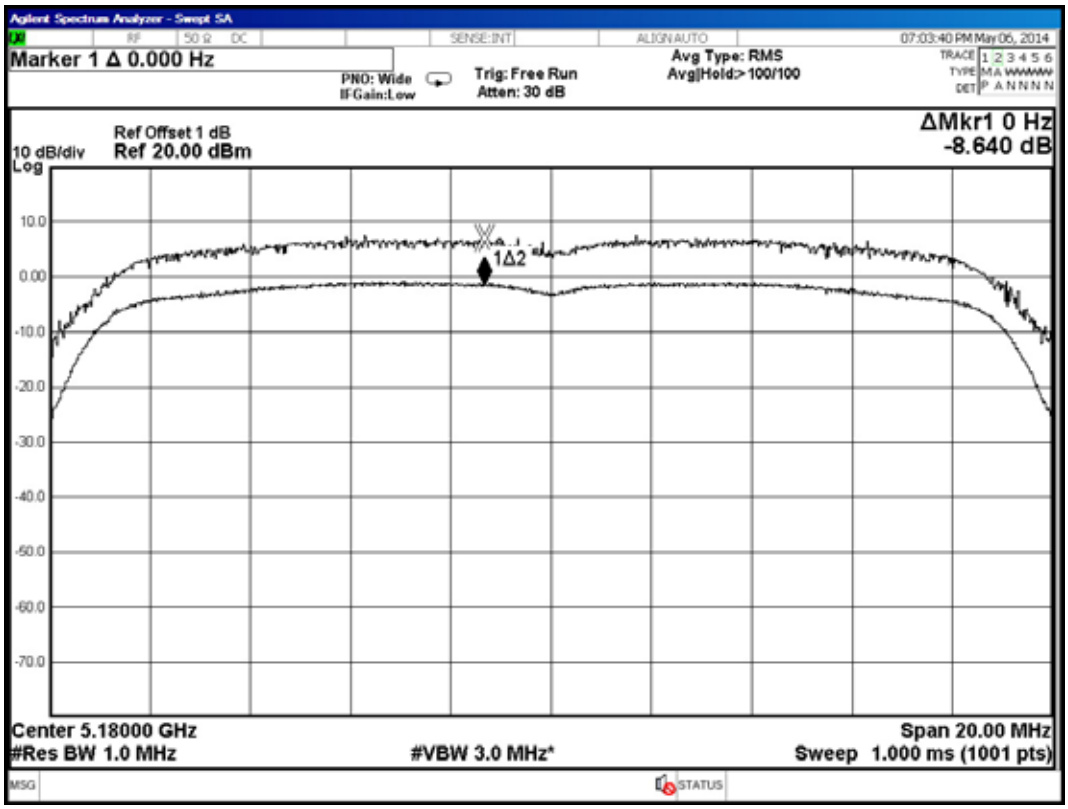
802.11a (UNII Band III), Frequency: 5700MHz



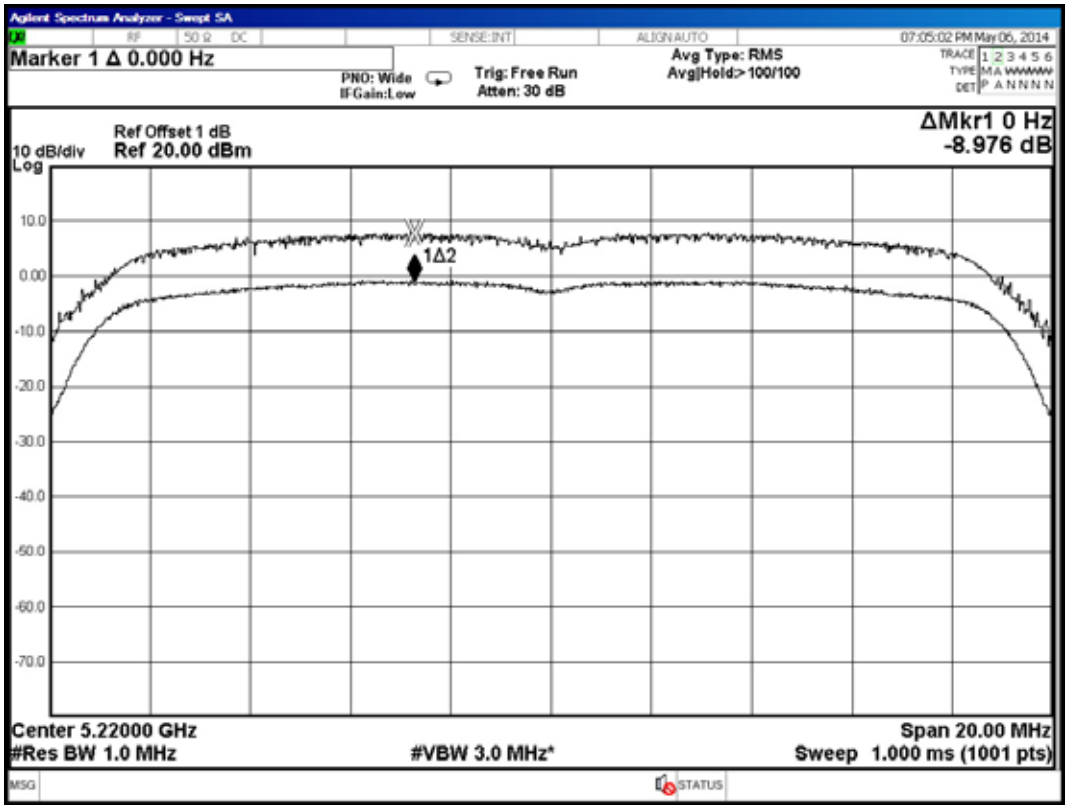
8.6.2. For 802.11n-HT20

Mode	UNII Band	Channel	Frequency	**Peak Power Excursion (dB)**	**Limit (dB)**
1.	UNII Band I	CH 36	5180MHz	**-8.640**	**13**
2.		CH 40	5200MHz	**-8.976**	**13**
3.		CH 48	5240MHz	**-9.890**	**13**
4.	UNII Band II	CH 52	5260MHz	**-10.501**	**13**
5.		CH 56	5280MHz	**-8.229**	**13**
6.		CH 64	5320MHz	**-8.628**	**13**
7.	UNII Band III	CH 100	5500MHz	**-12.252**	**13**
8.		CH 116	5580MHz	**-8.032**	**13**
9.		CH 140	5700MHz	**-8.065**	**13**

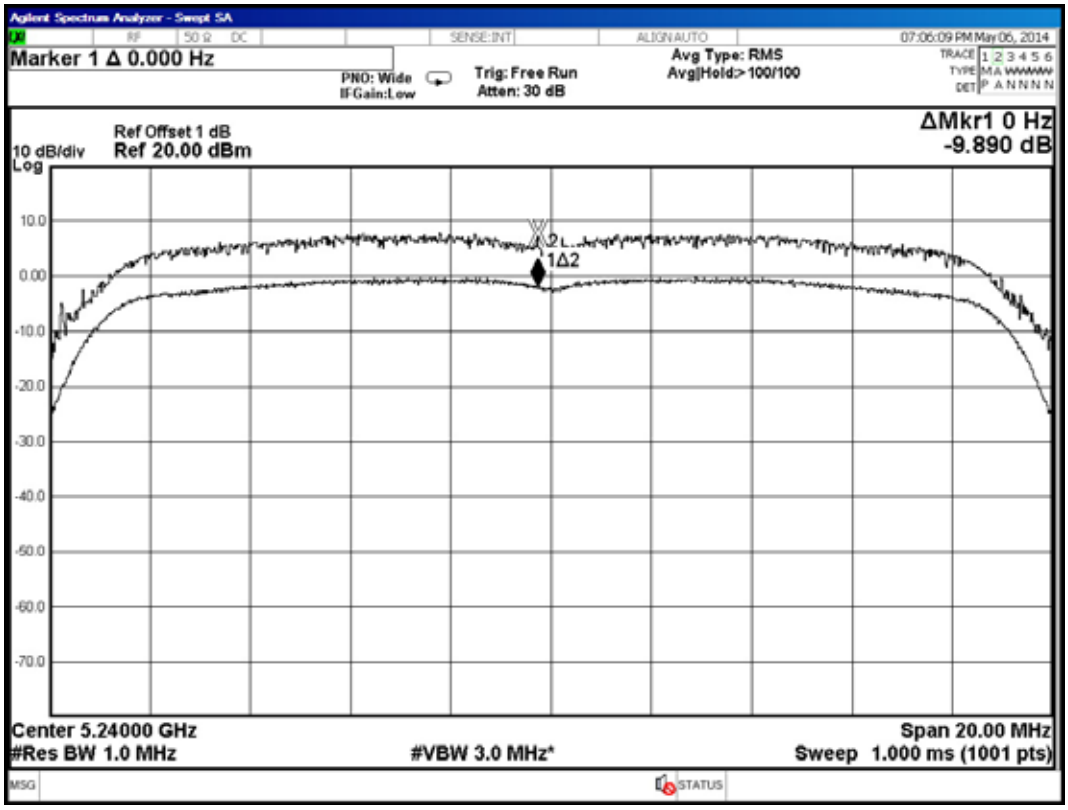
802.11n-HT20 (UNII Band I), Frequency: 5180MHz



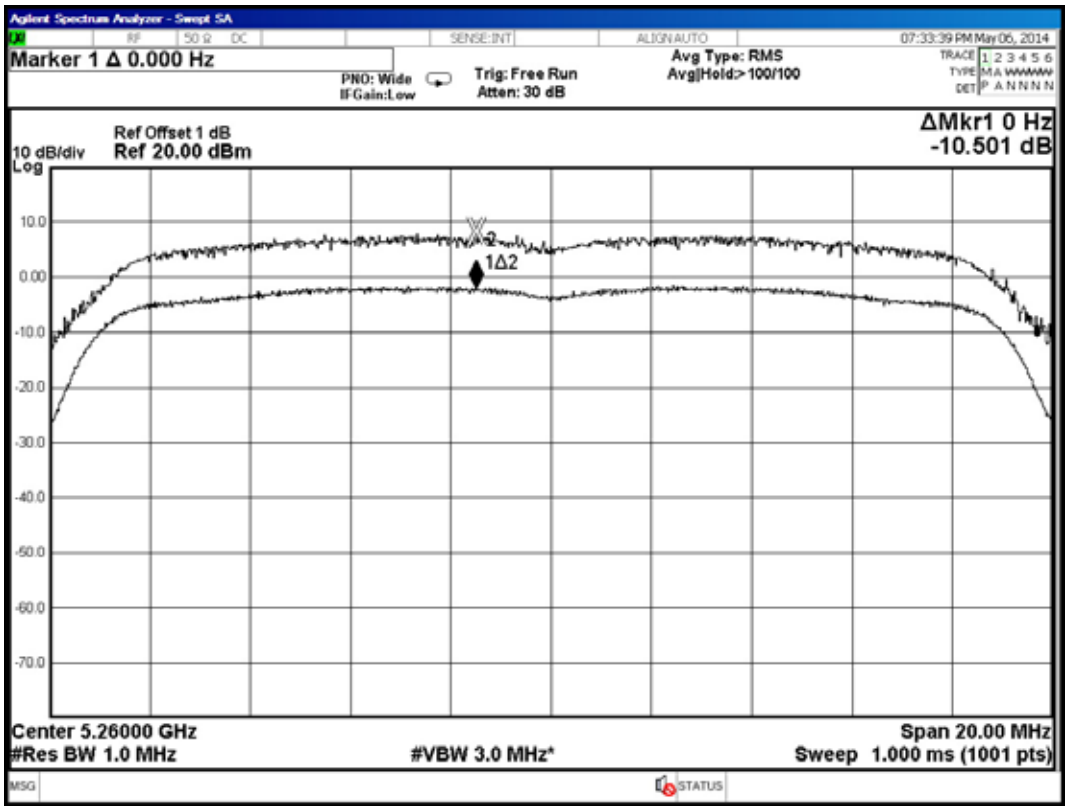
802.11n-HT20 (UNII Band I), Frequency: 5200MHz



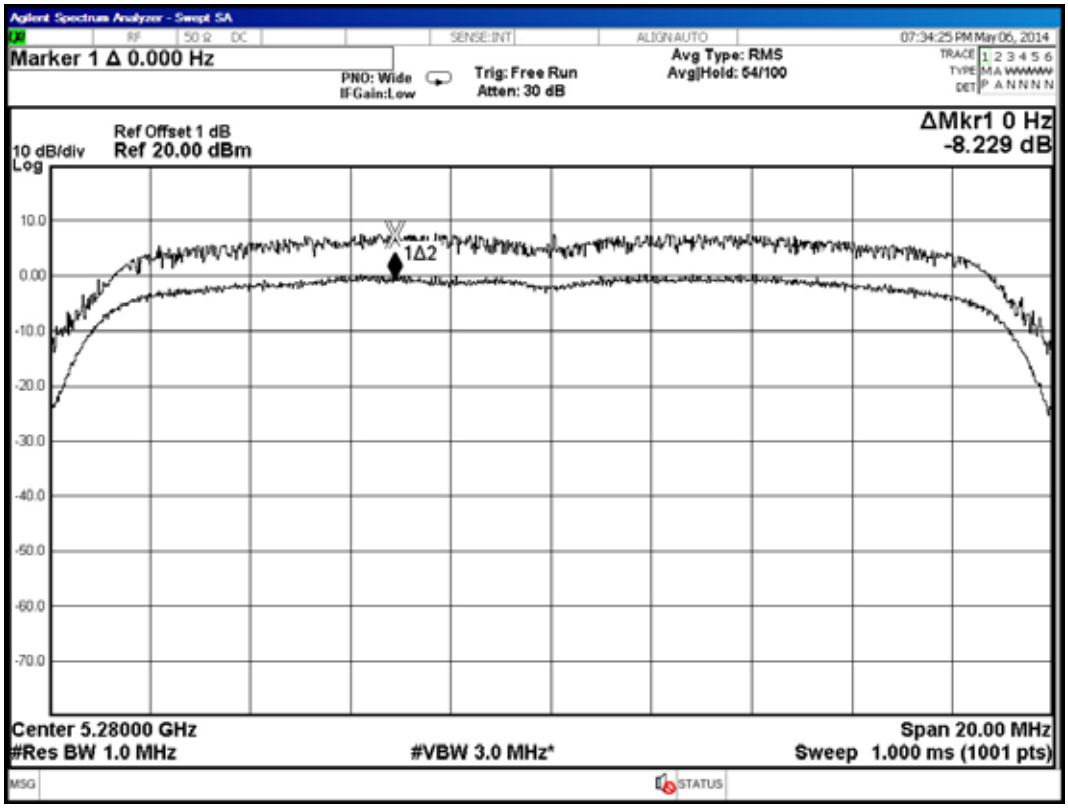
802.11n-HT20 (UNII Band I), Frequency: 5240MHz



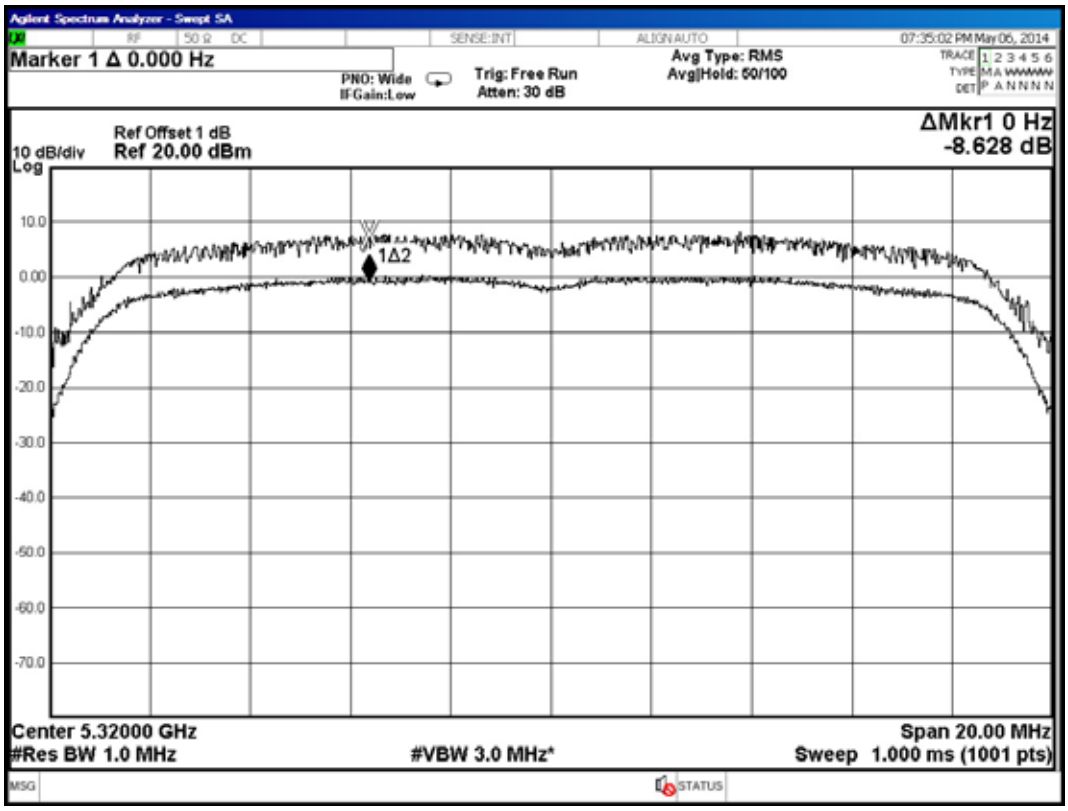
802.11n-HT20 (UNII Band II), Frequency: 5260MHz



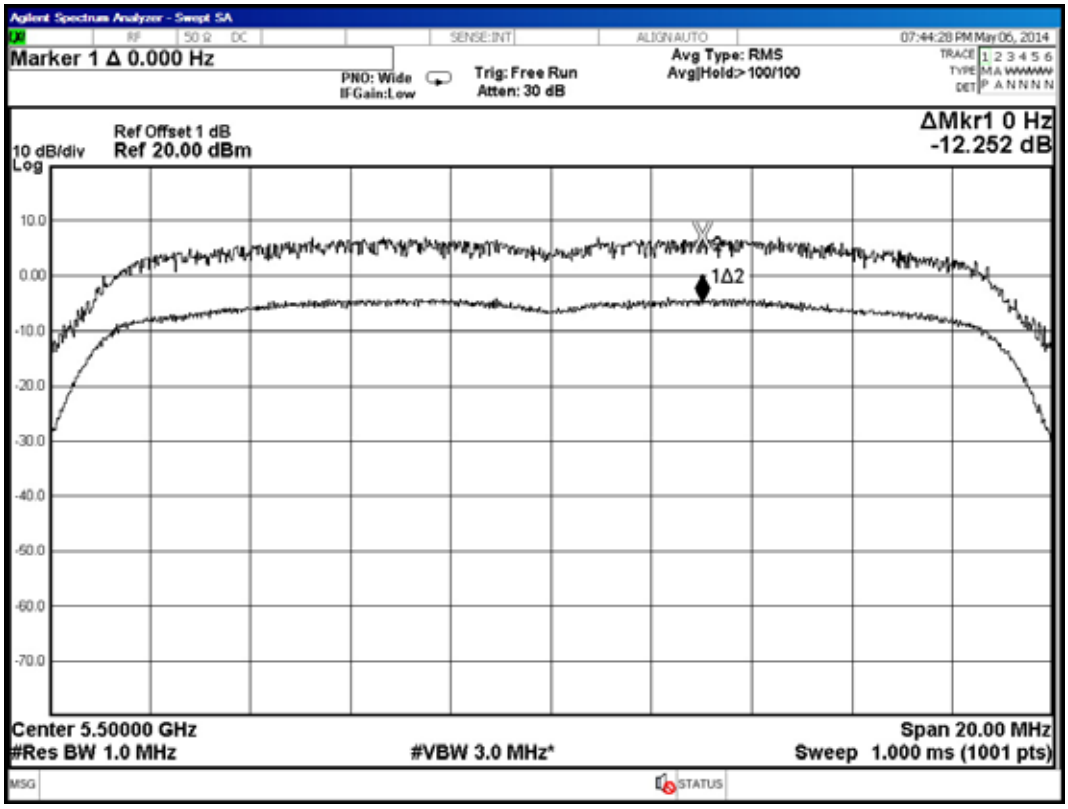
802.11n-HT20 (UNII Band II), Frequency: 5280MHz



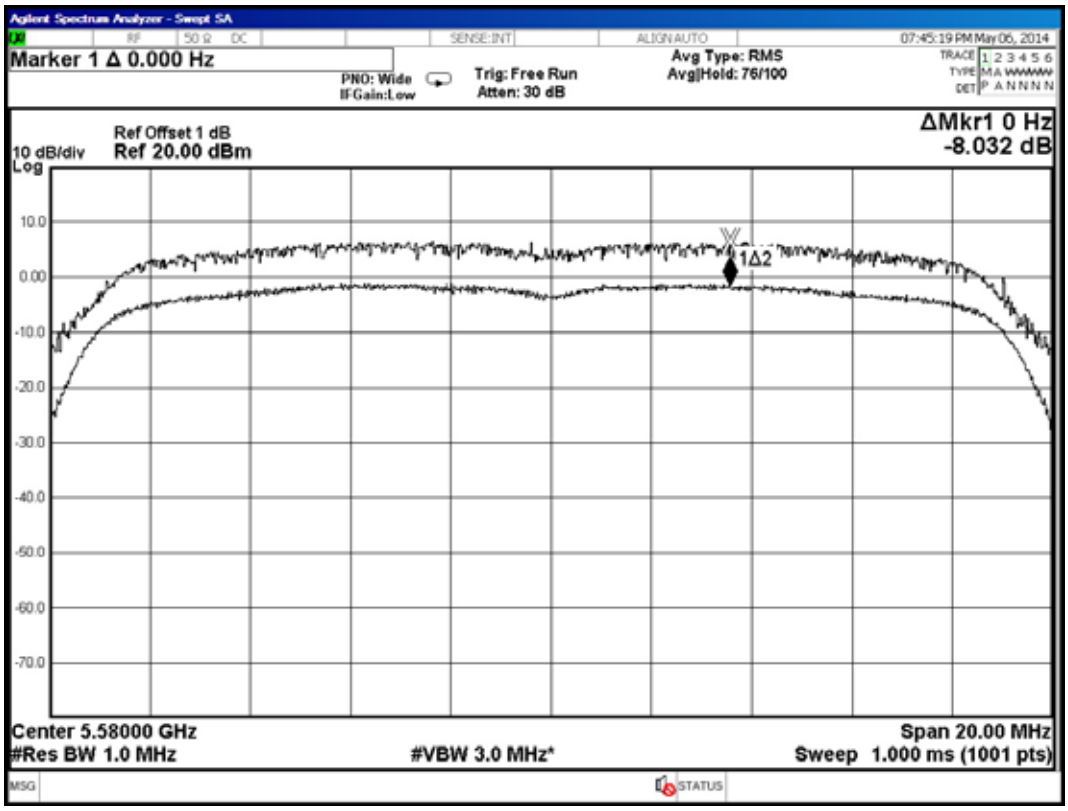
802.11n-HT20 (UNII Band II), Frequency: 5320MHz



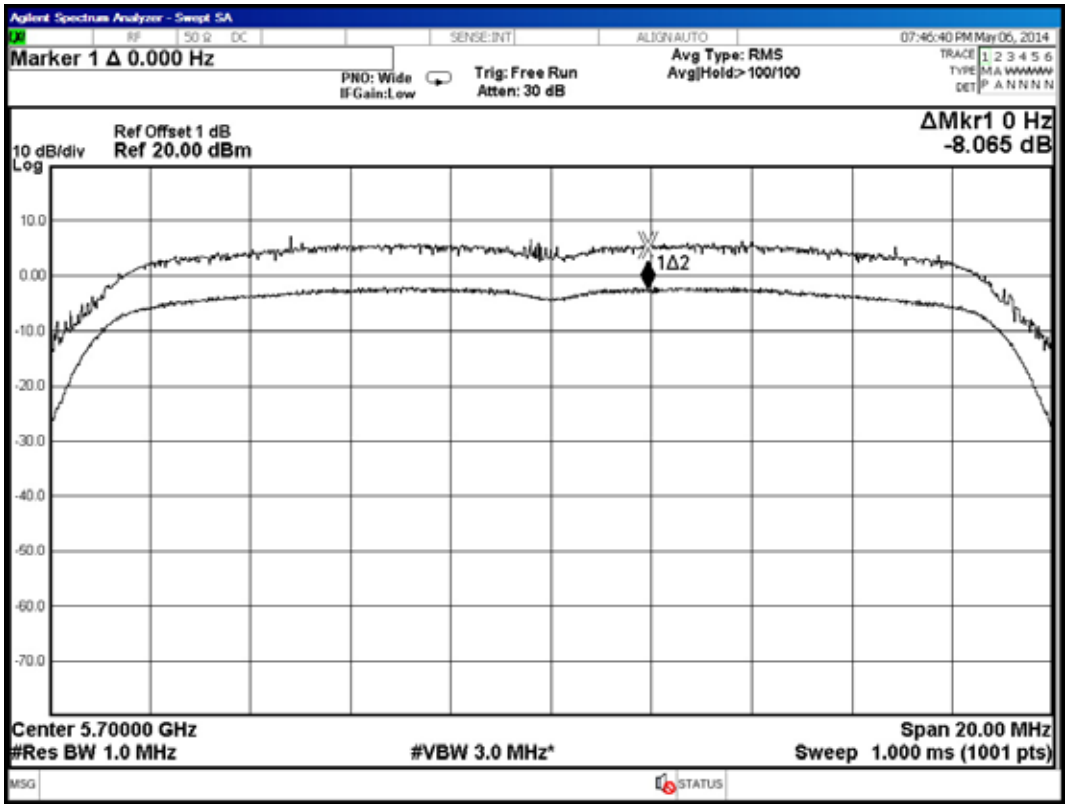
802.11n-HT20 (UNII Band III), Frequency: 5500MHz



802.11n-HT20 (UNII Band III), Frequency: 5580MHz



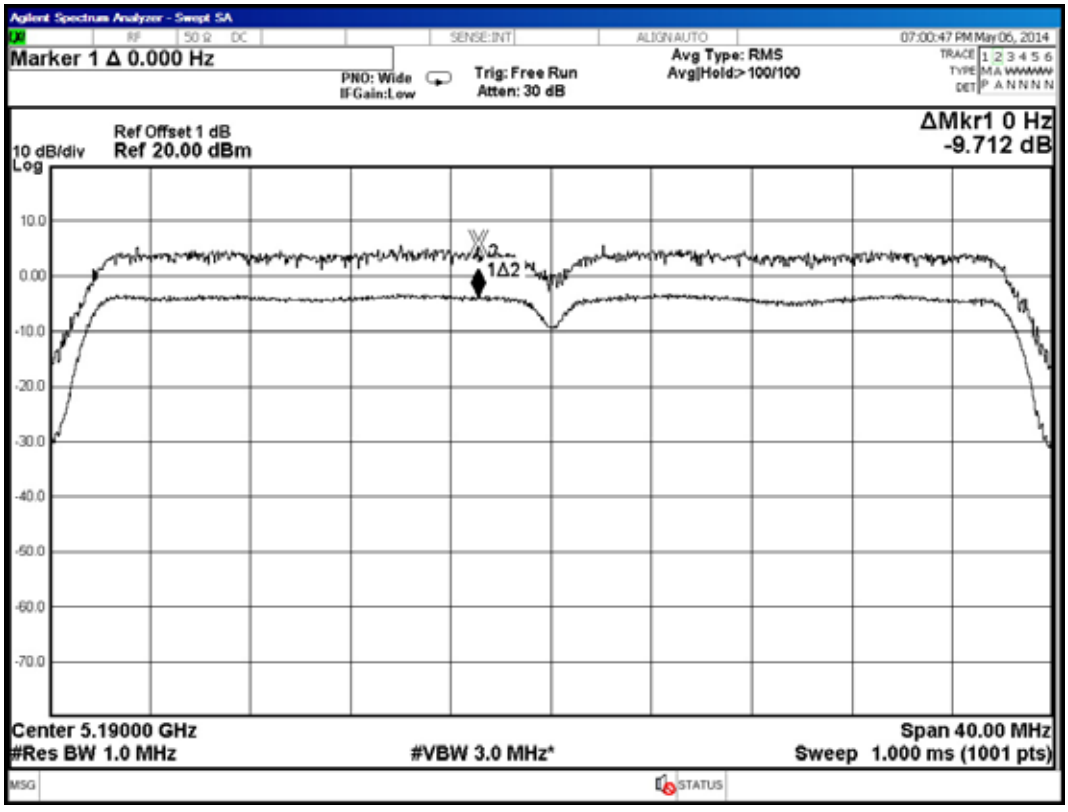
802.11n-HT20 (UNII Band III), Frequency: 5700MHz



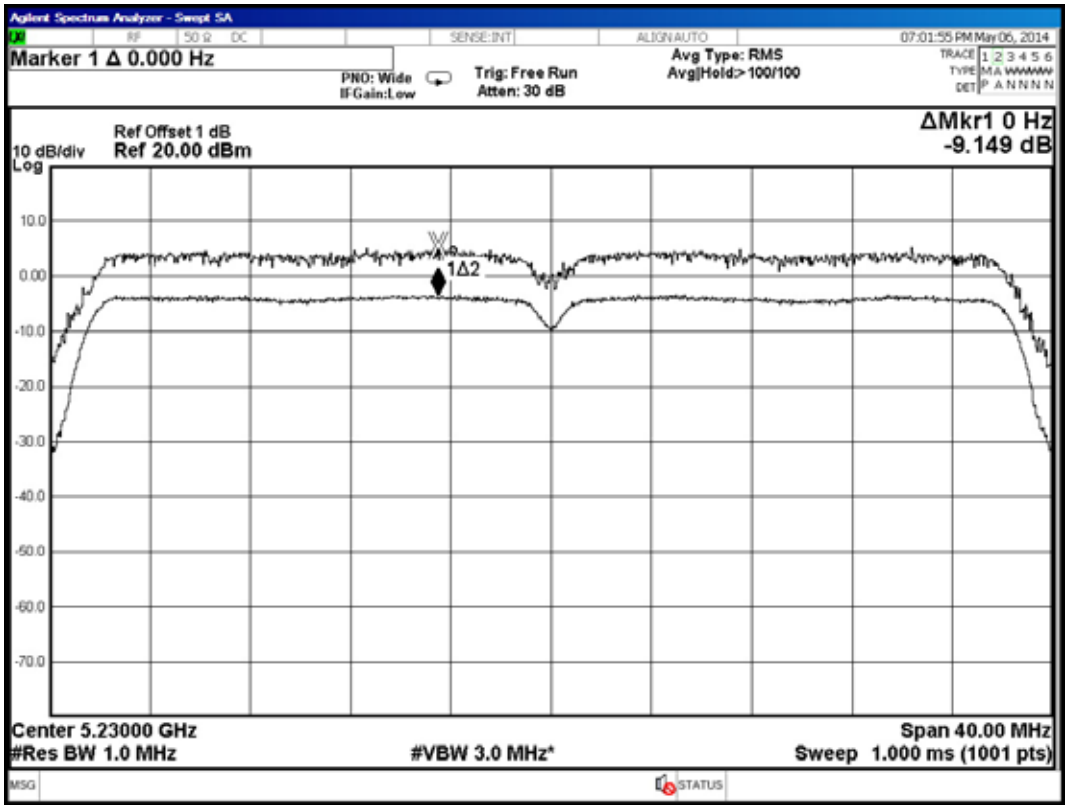
8.6.3. For 802.11n-HT40

Mode	UNII Band	Channel	Frequency	**Power Spectral Density (dB)**	**Limit (dB)**
1.	UNII Band I	CH 38	5190MHz	**-9.712**	**13**
2.		CH 46	5230MHz	**-9.149**	**13**
3.	UNII Band II	CH 54	5270MHz	**-8.365**	**13**
4.		CH 62	5310MHz	**-8.927**	**13**
5.	UNII Band III	CH 100	5510MHz	**-10.211**	**13**
6.		CH 110	5550MHz	**-10.945**	**13**
7.		CH 116	5670MHz	**-10.372**	**13**

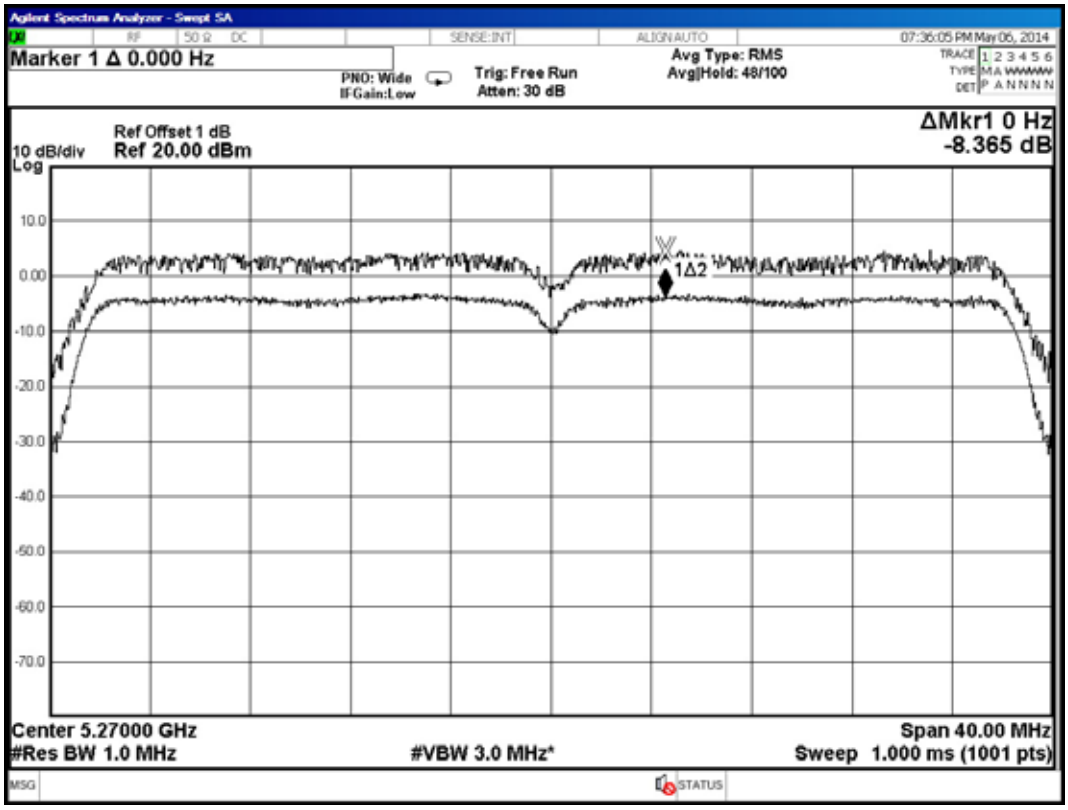
802.11n-HT40 (UNII Band I), Frequency: 5190MHz



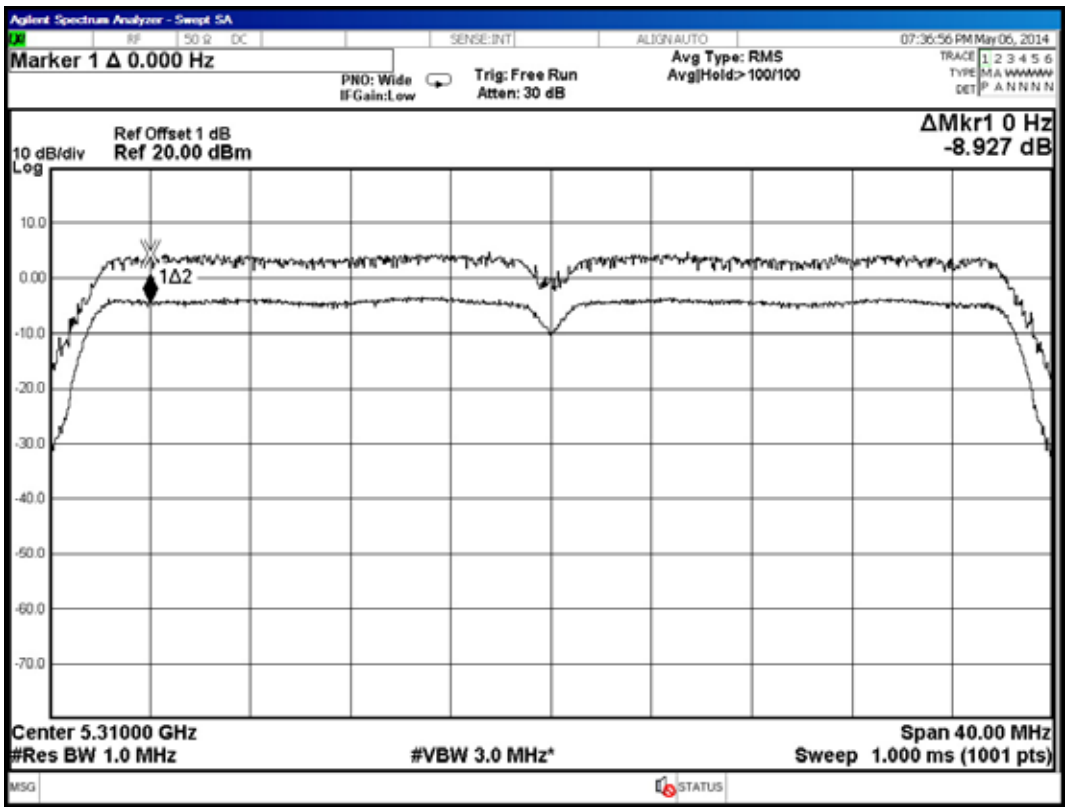
802.11n-HT40 (UNII Band I), Frequency: 5230MHz



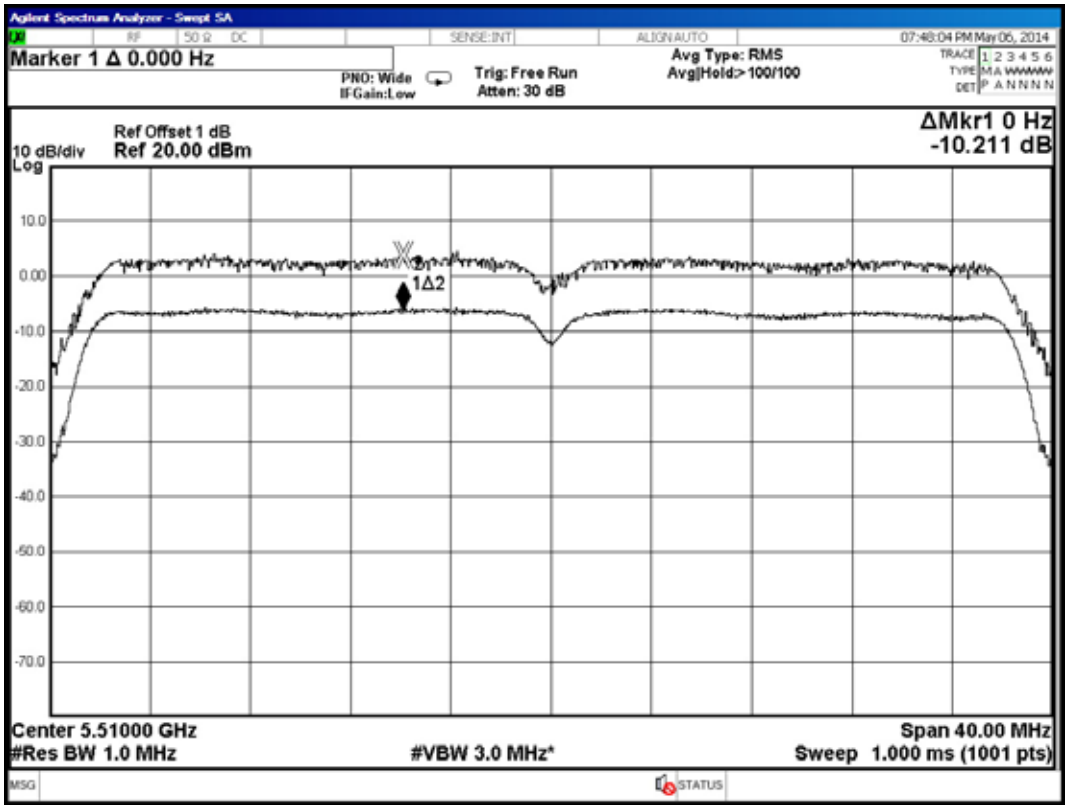
802.11n-HT40 (UNII Band II), Frequency: 5270MHz



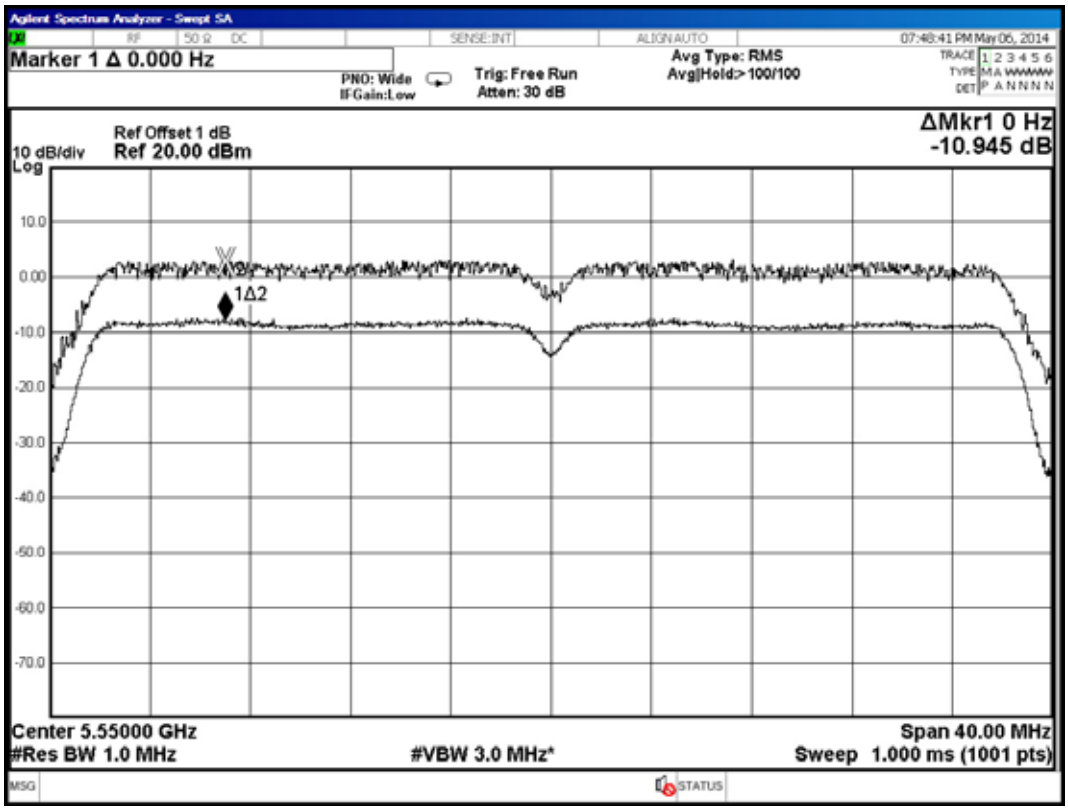
802.11n-HT40 (UNII Band II), Frequency: 5310MHz



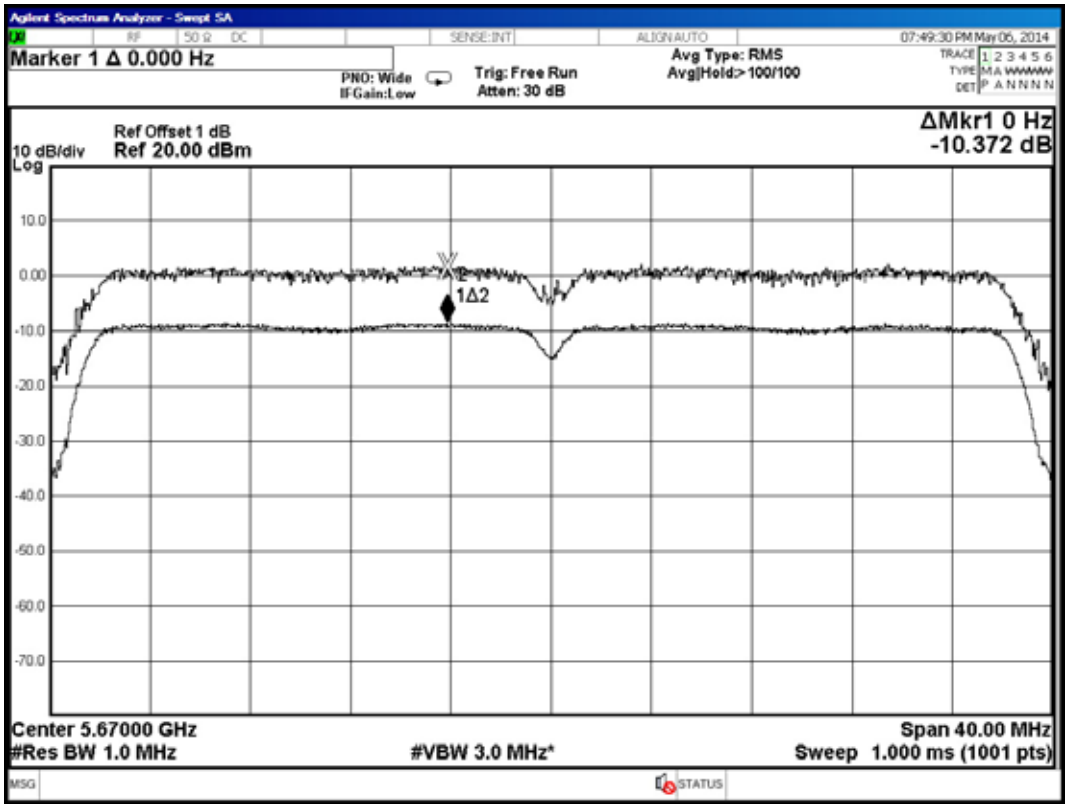
802.11n-HT40 (UNII Band III), Frequency: 5510MHz



802.11n-HT40 (UNII Band III), Frequency: 5550MHz



802.11n-HT40 (UNII Band III), Frequency: 5670MHz



9. DEVIATION TO TEST SPECIFICATIONS

【NONE】