

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 ≥ 300 kHz 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°C Humidity : 50%

Test Date: 2014. 05. 06 Temperature: 23°C 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

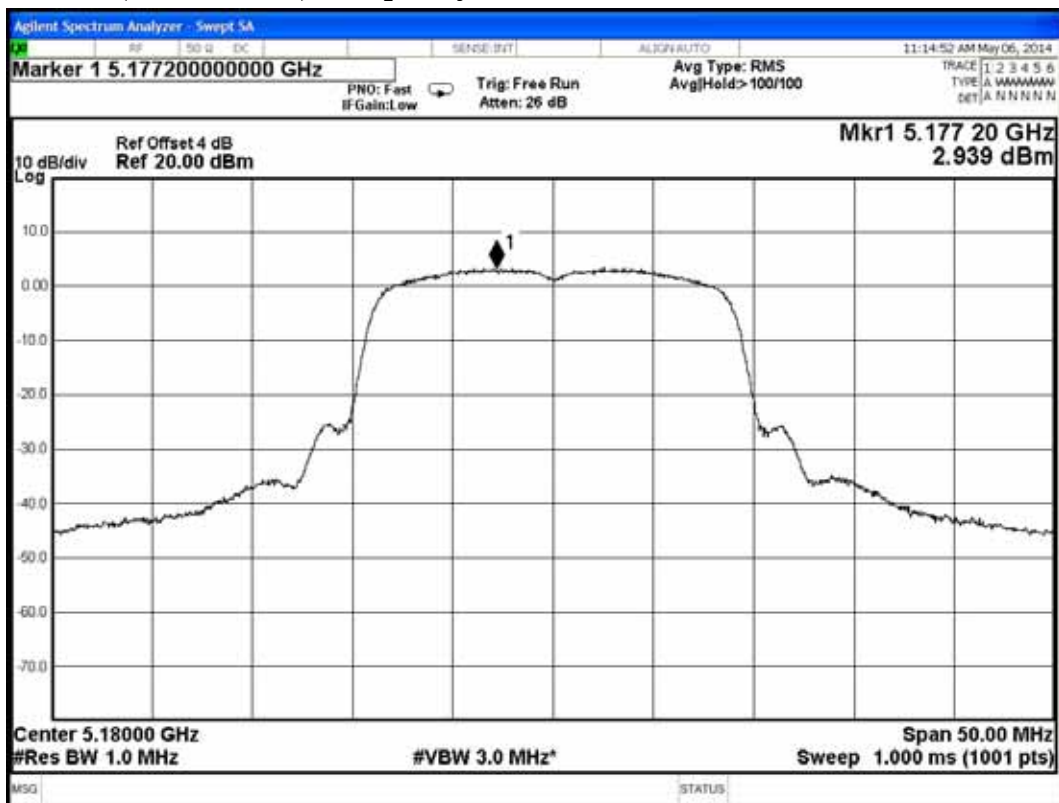
Mode	UNII Band	Channel	Frequency	Power Density (dBm/100kHz)	BWCF Factor 100kHz to 500kHz	Total Power Density
10.	UNII Band III	CH 149	5745MHz	-0.391	6.989	6.598
11.		CH 157	5785MHz	-0.427		6.562
12.		CH 165	5825MHz	-3.709		3.280

Limit: 30dBm

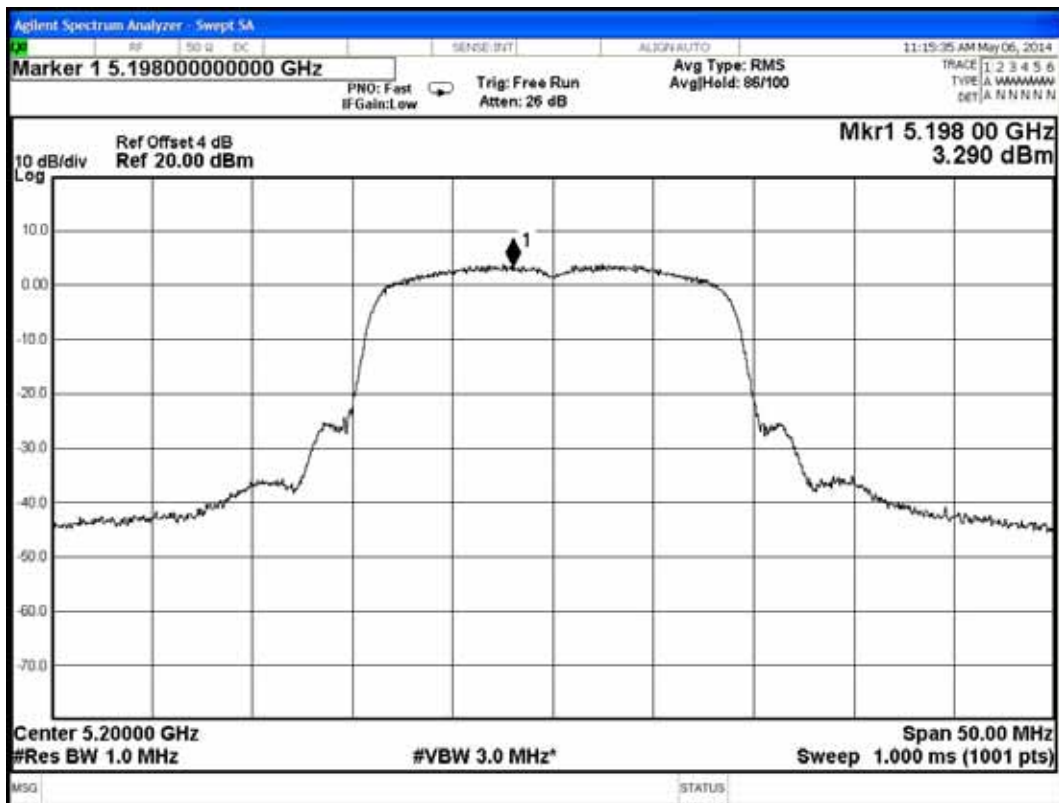
Note: 1. BCW Factor= $10 \log (500/100)$

2. Total Power Density= Power Density + BWCF Factor

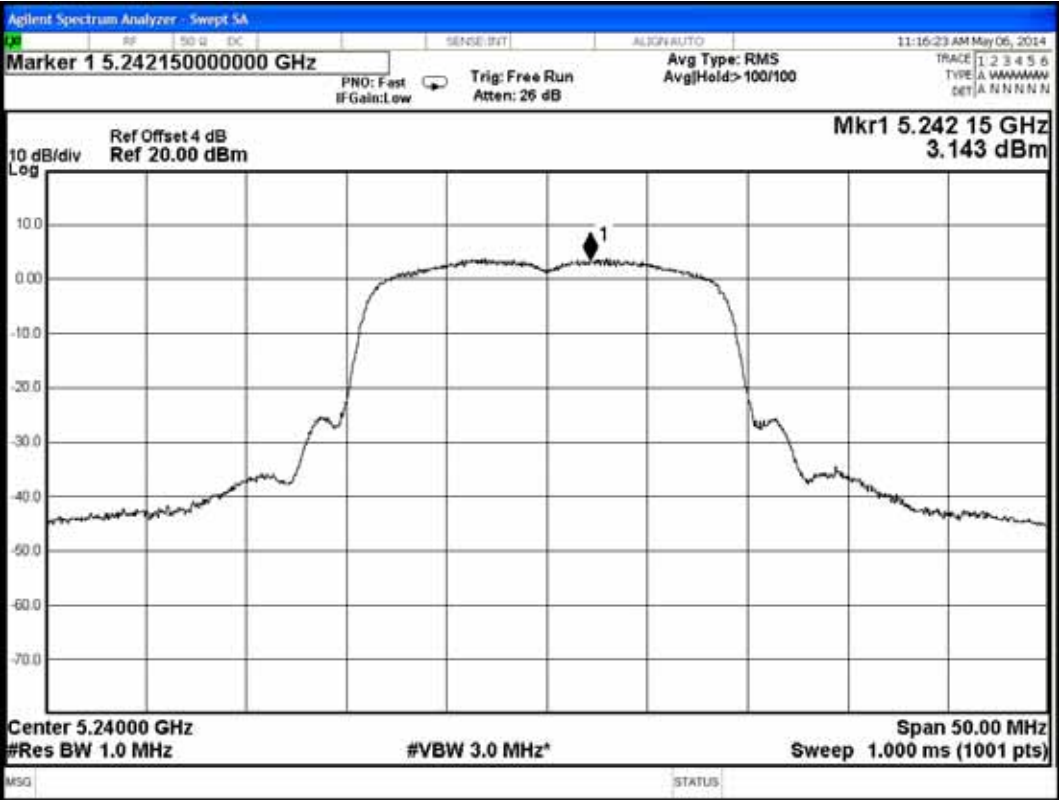
802.11a (UNII Band I), Frequency: 5180MHz



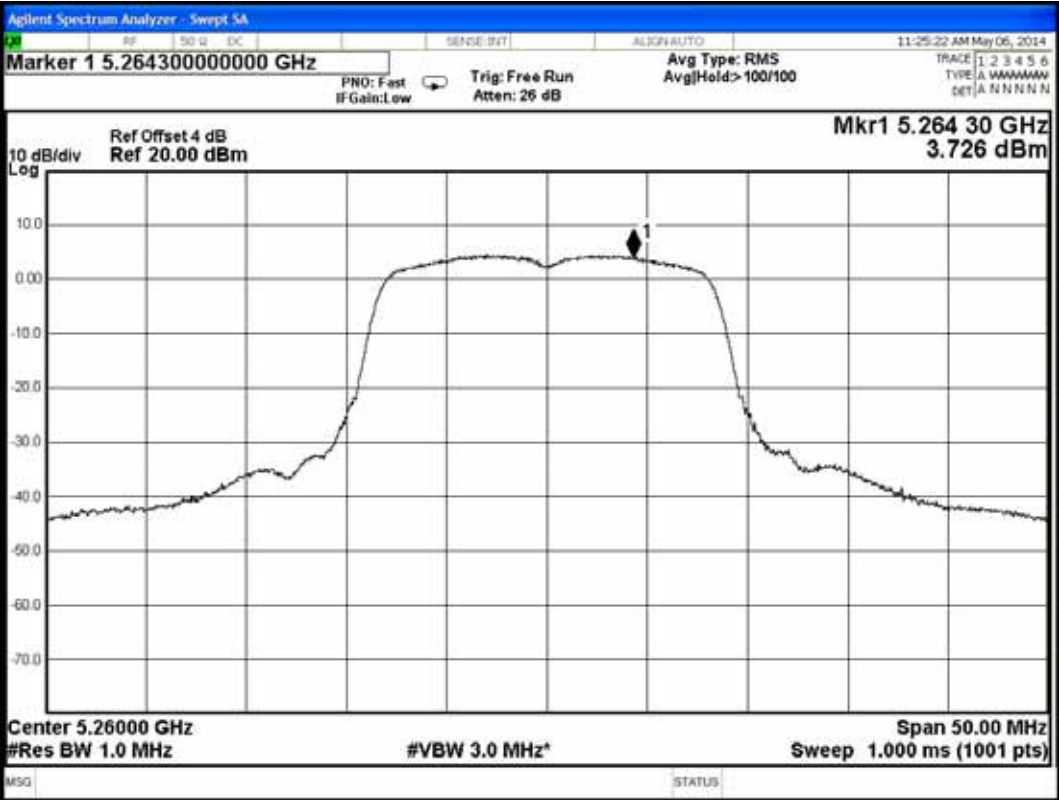
802.11a (UNII Band I), Frequency: 5200MHz



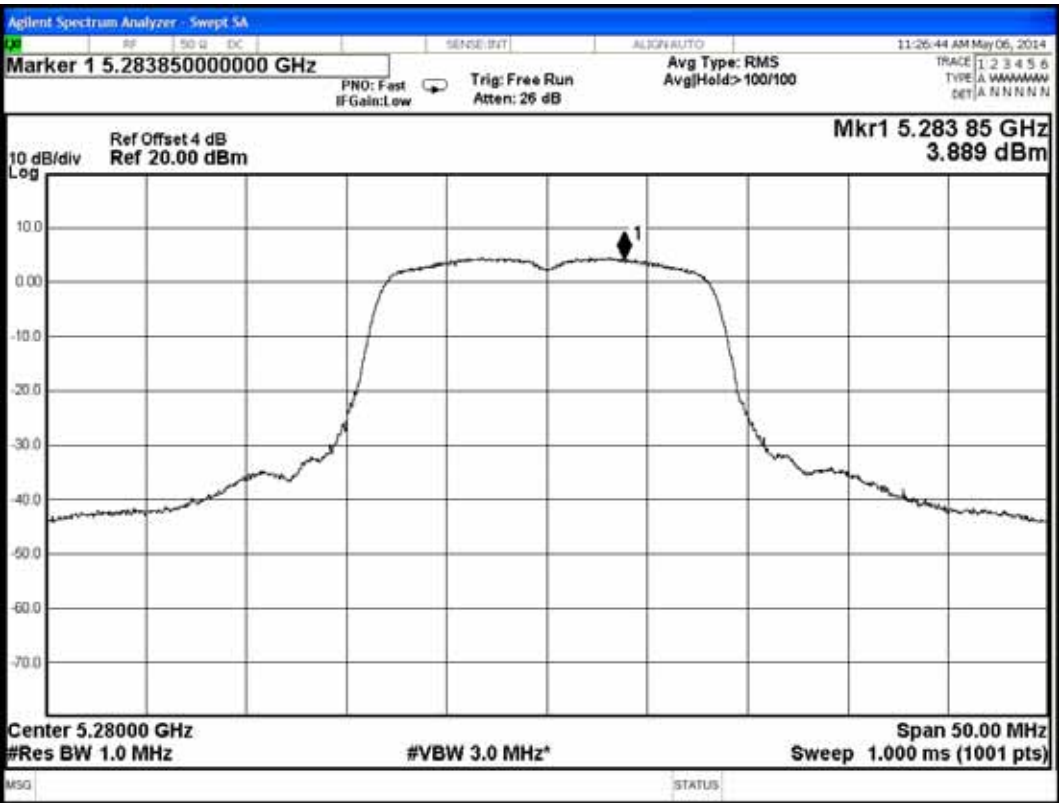
802.11a (UNII Band I), Frequency: 5240MHz



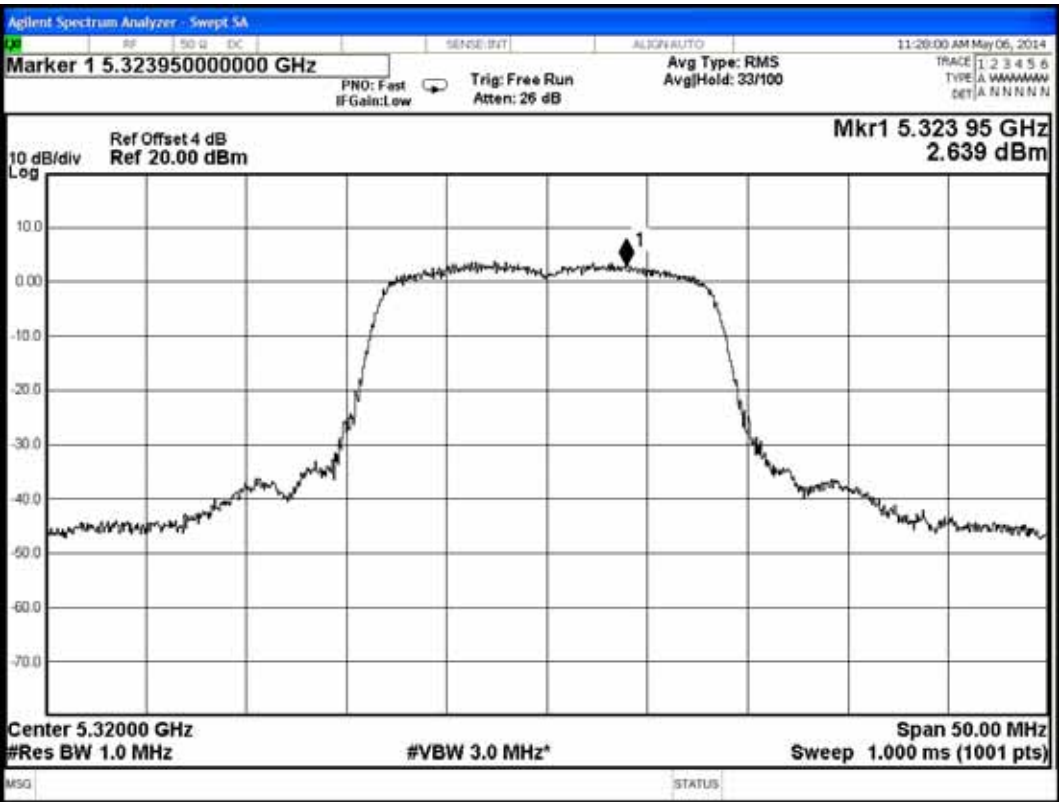
802.11a (UNII Band II-2A), Frequency: 5260MHz



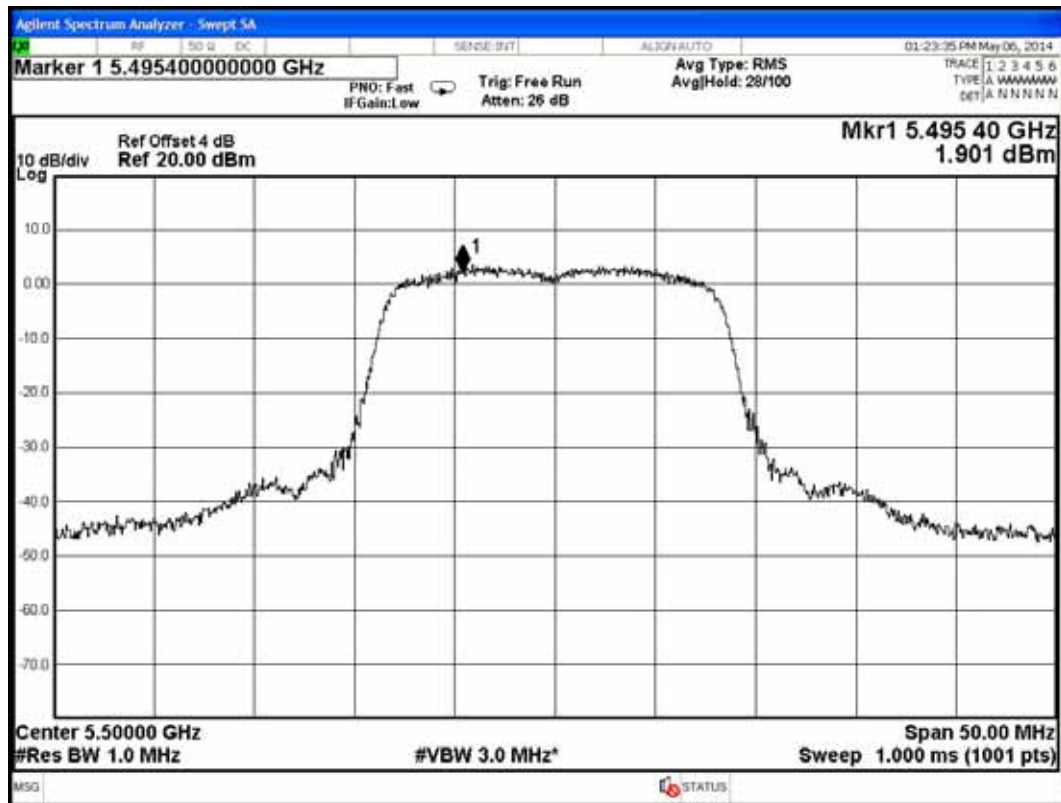
802.11a (UNII Band II-2A), Frequency: 5280MHz



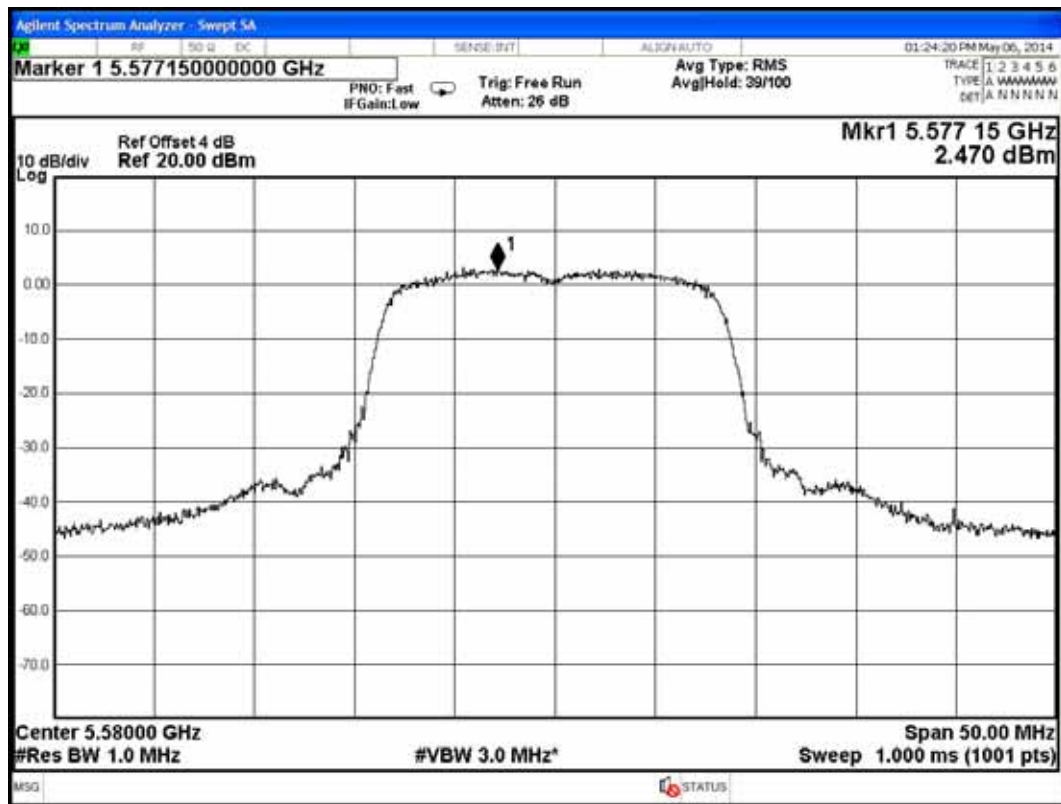
802.11a (UNII Band II-2A), Frequency: 5320MHz

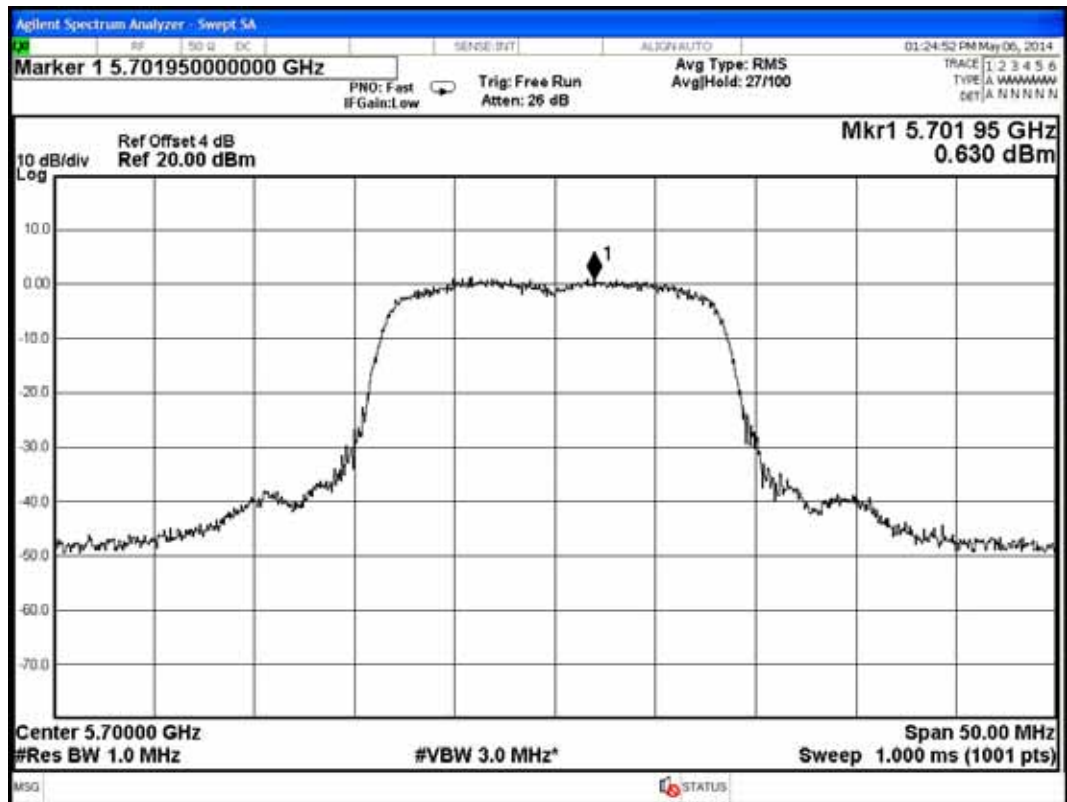


802.11a (UNII Band II-2C), Frequency: 5500MHz



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



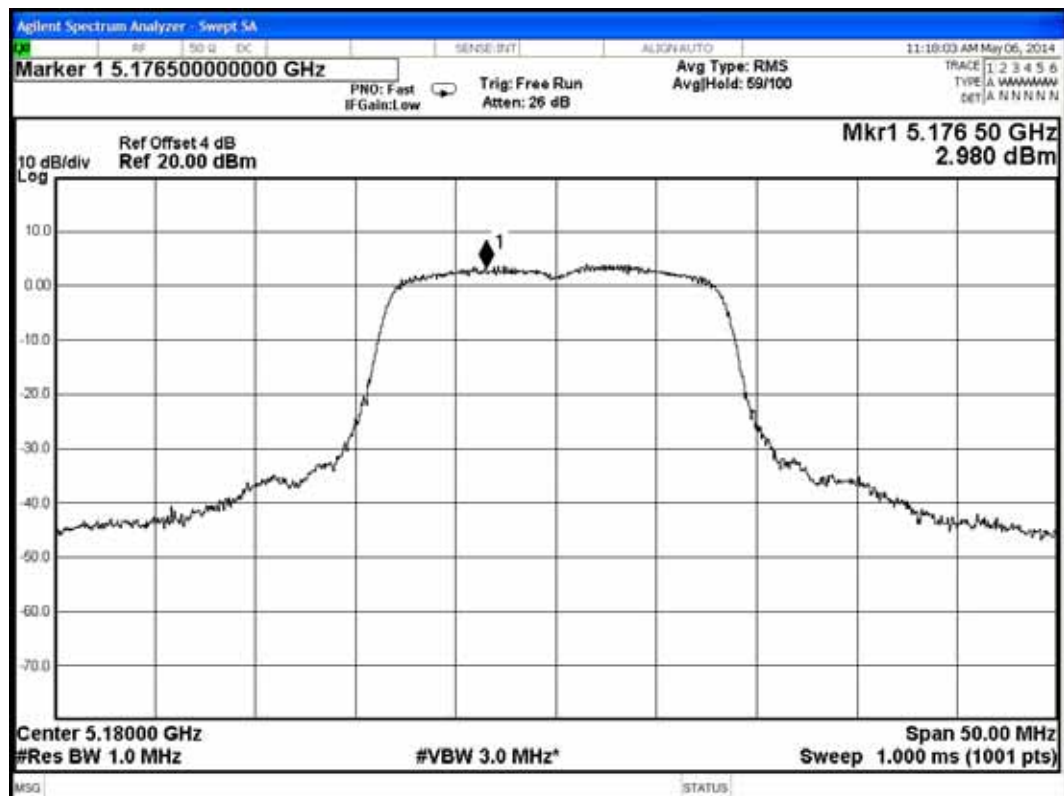
7.6.2. For 802.11n-HT20

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

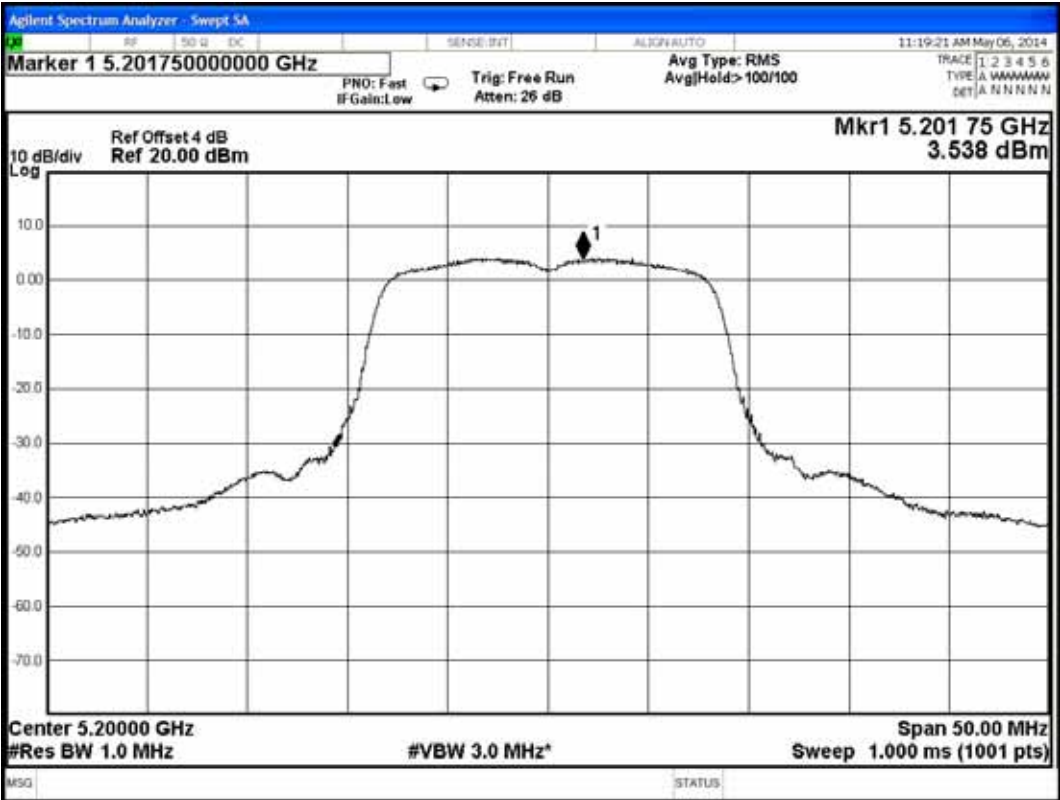
Mode	UNII Band	Channel	Frequency	Power Density (dBm/100kHz)	BWCF Factor 100kHz to 500kHz	Total Power Density
10.	UNII Band III	CH 149	5745MHz	-0.198	6.989	6.791
11.		CH 157	5785MHz	-0.498		6.491
12.		CH 165	5825MHz	-0.498		6.491

Limit: 30dBmNote: 1. BCW Factor= $10 \log (500/100)$

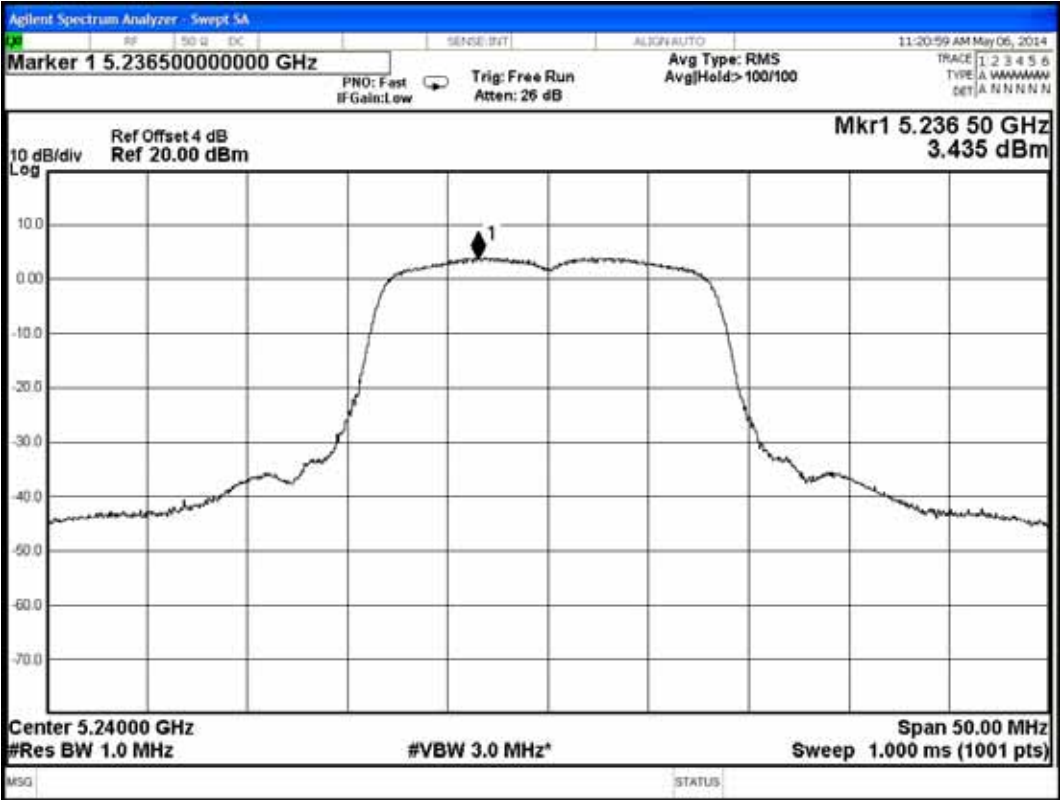
2. Total Power Density= Power Density + BWCF Factor

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

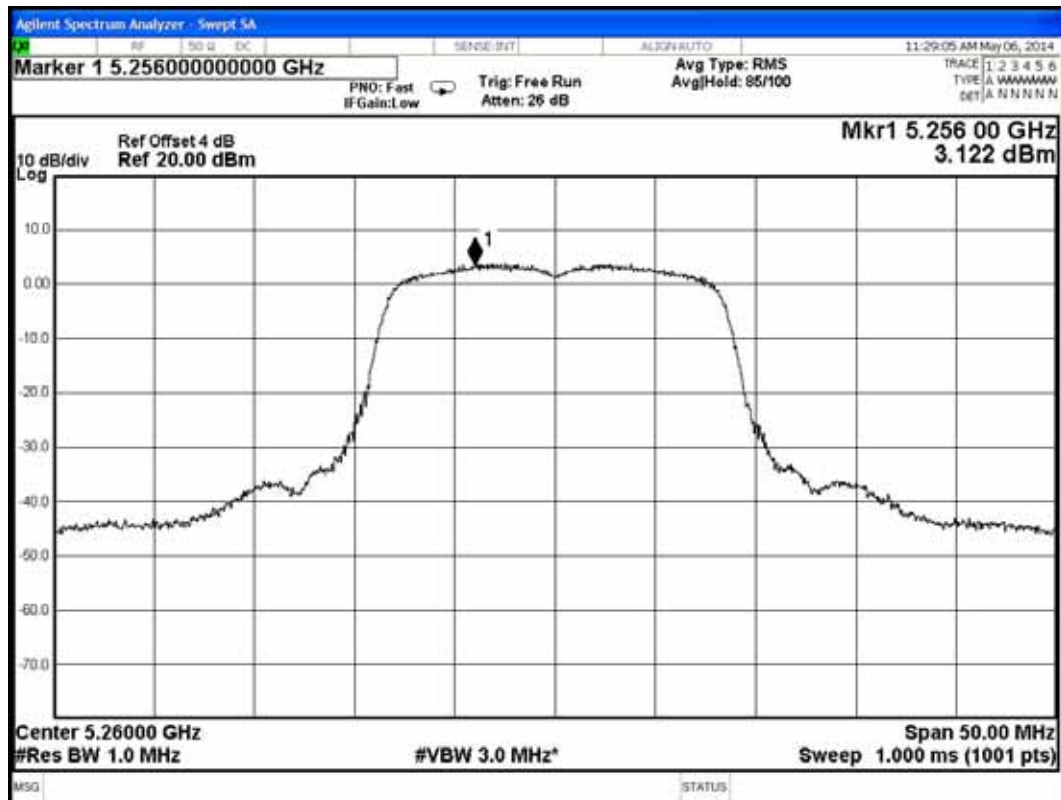
802.11n-HT20 (UNII Band I), Frequency: 5200MHz



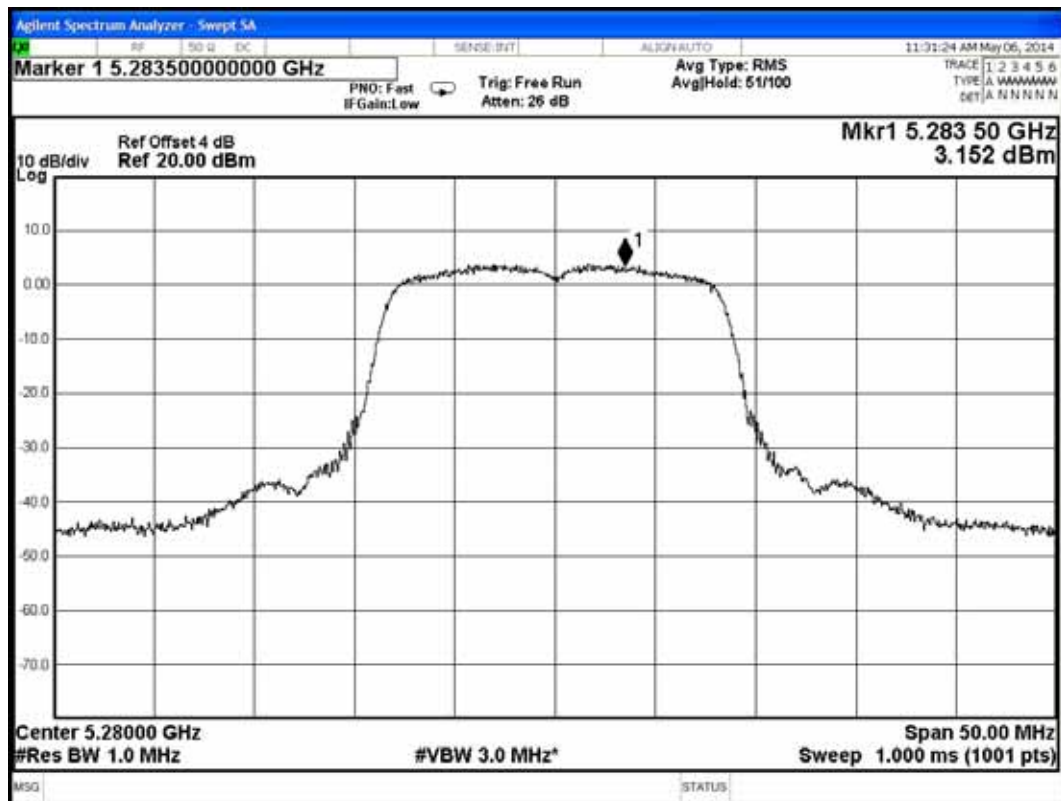
802.11n-HT20 (UNII Band I), Frequency: 5240MHz



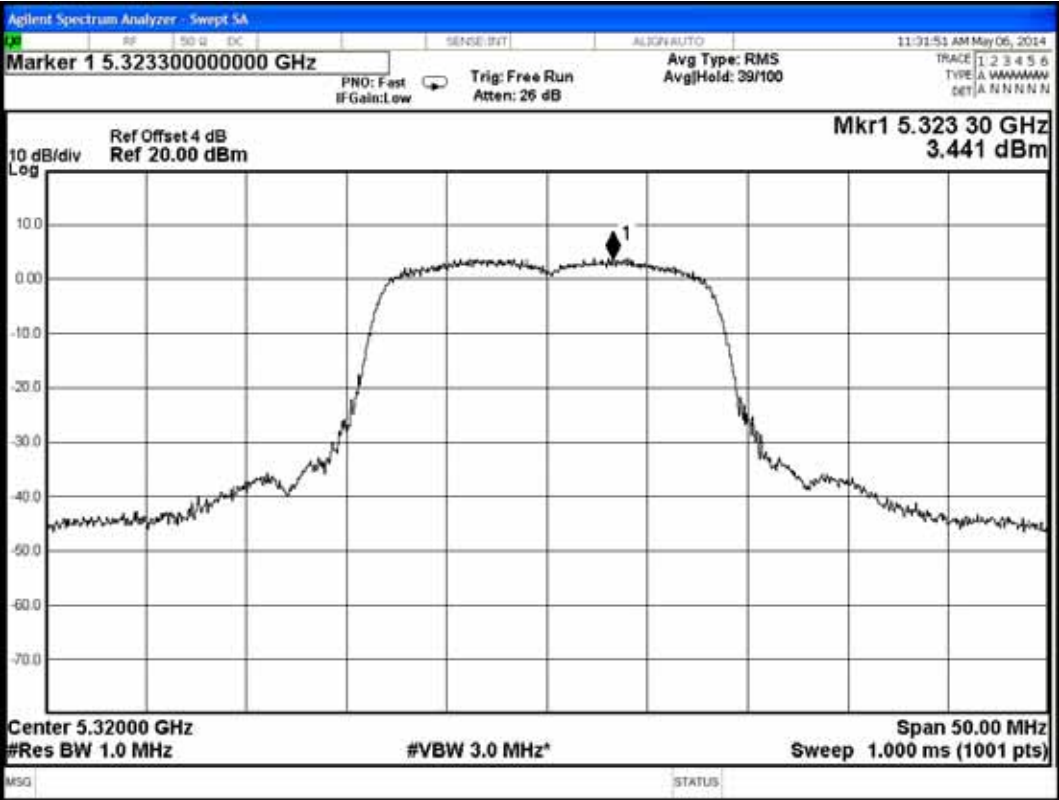
802.11n-HT20 (UNII Band II-2A), Frequency: 5260MHz



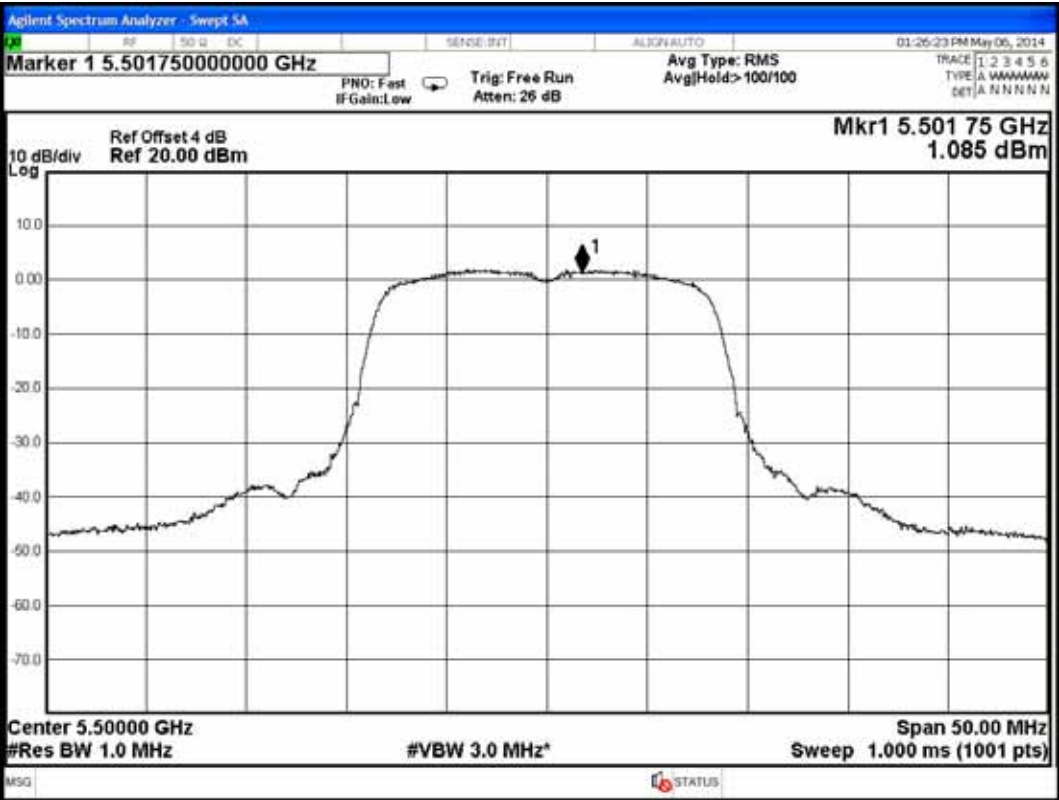
802.11n-HT20 (UNII Band II-2A), Frequency: 5280MHz



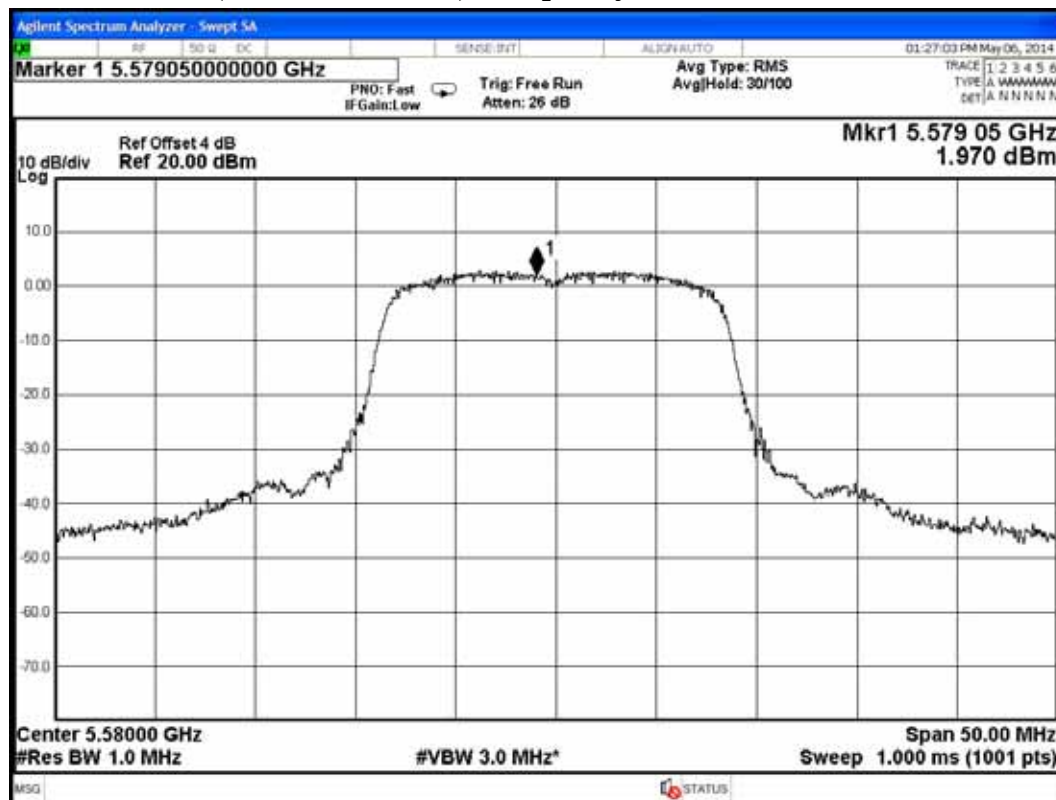
802.11n-HT20 (UNII Band II-2A), Frequency: 5320MHz



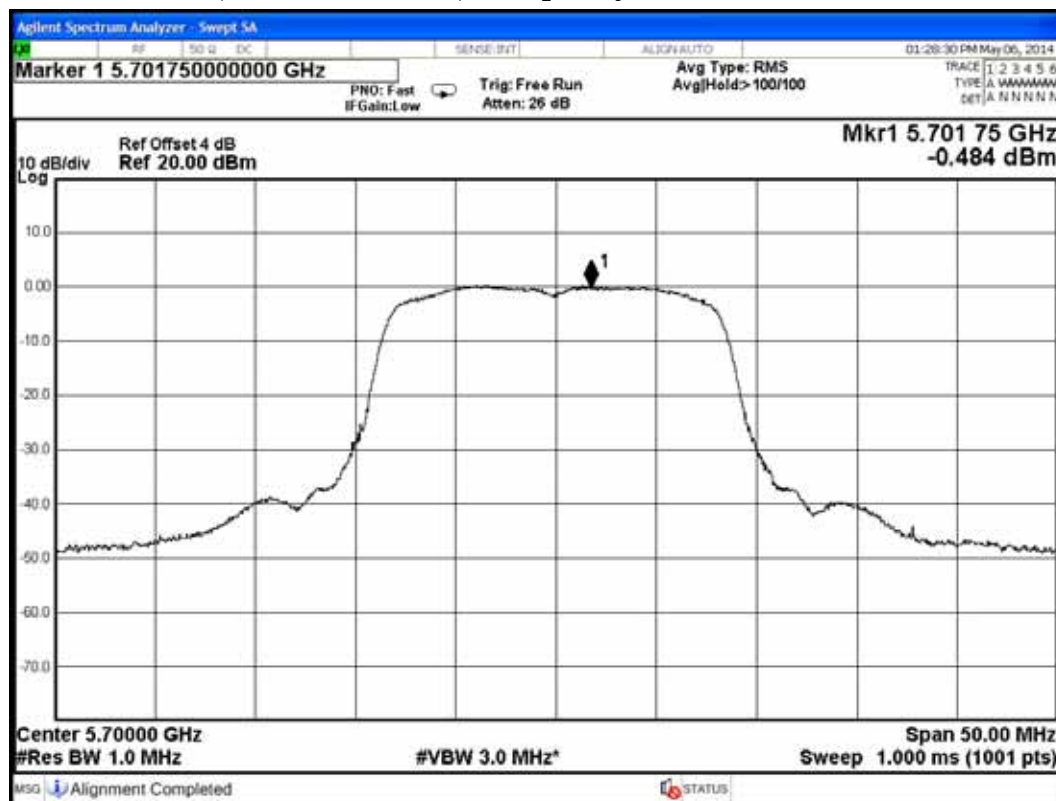
802.11n-HT20 (UNII Band II-2C), Frequency: 5500MHz

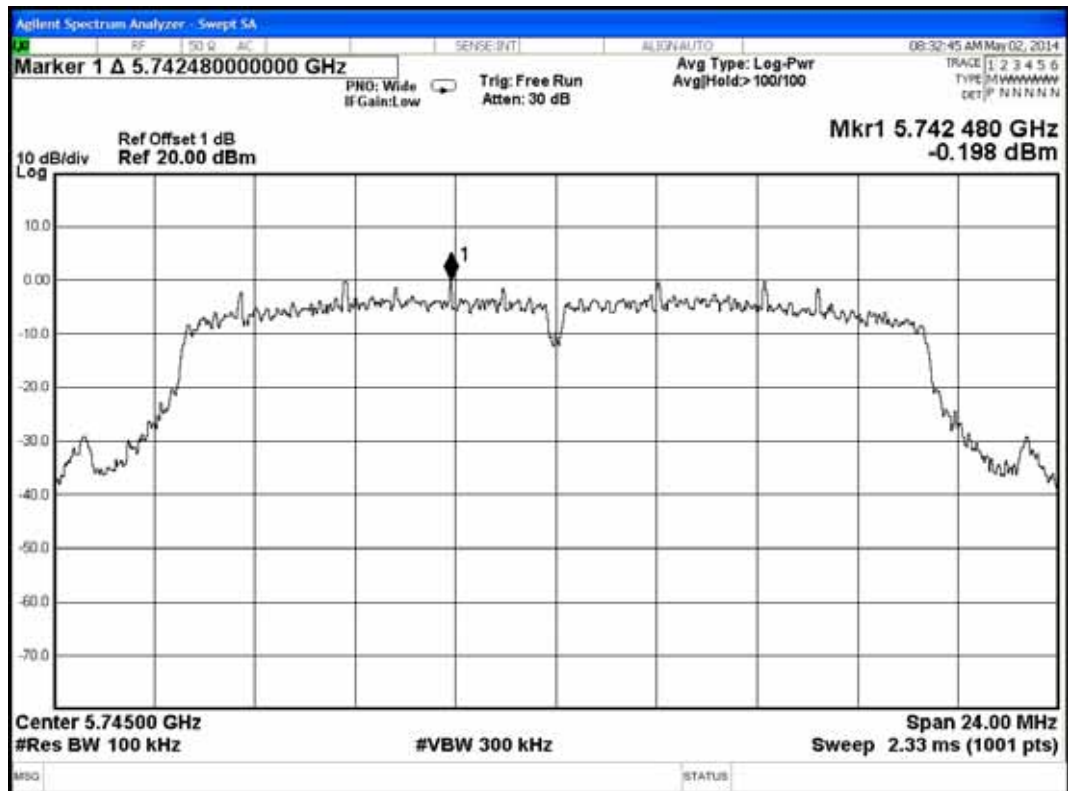
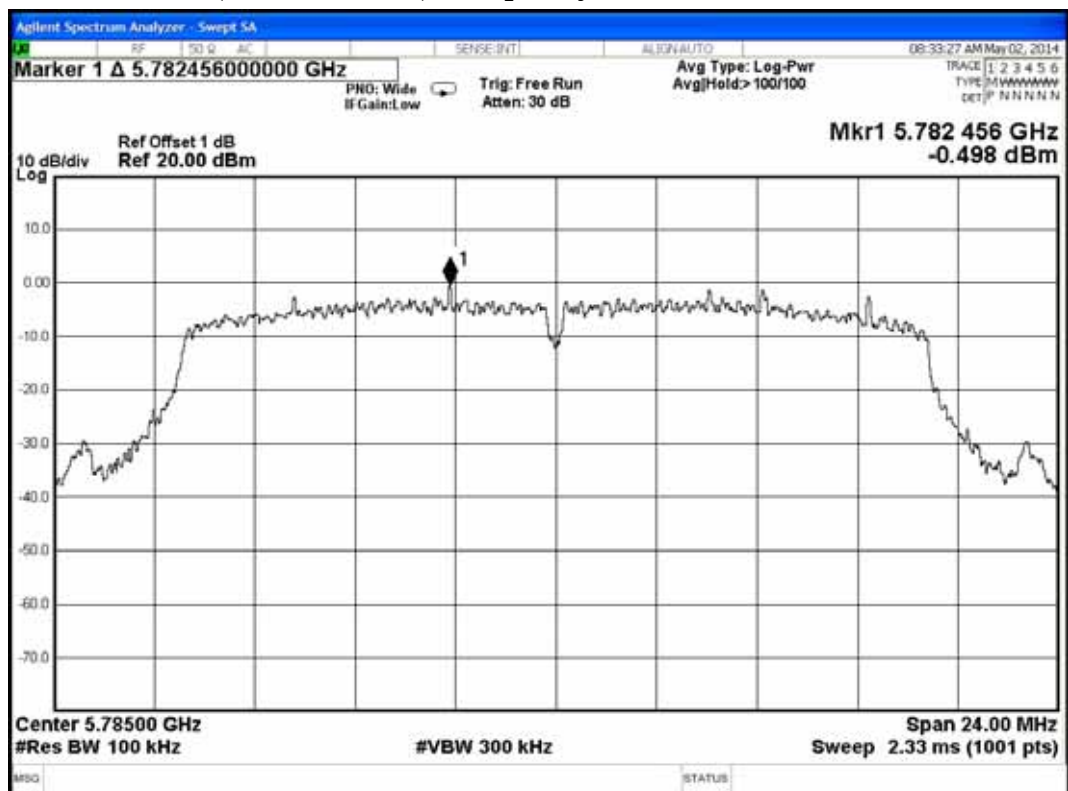


802.11n-HT20 (UNII Band II-2C), Frequency: 5580MHz

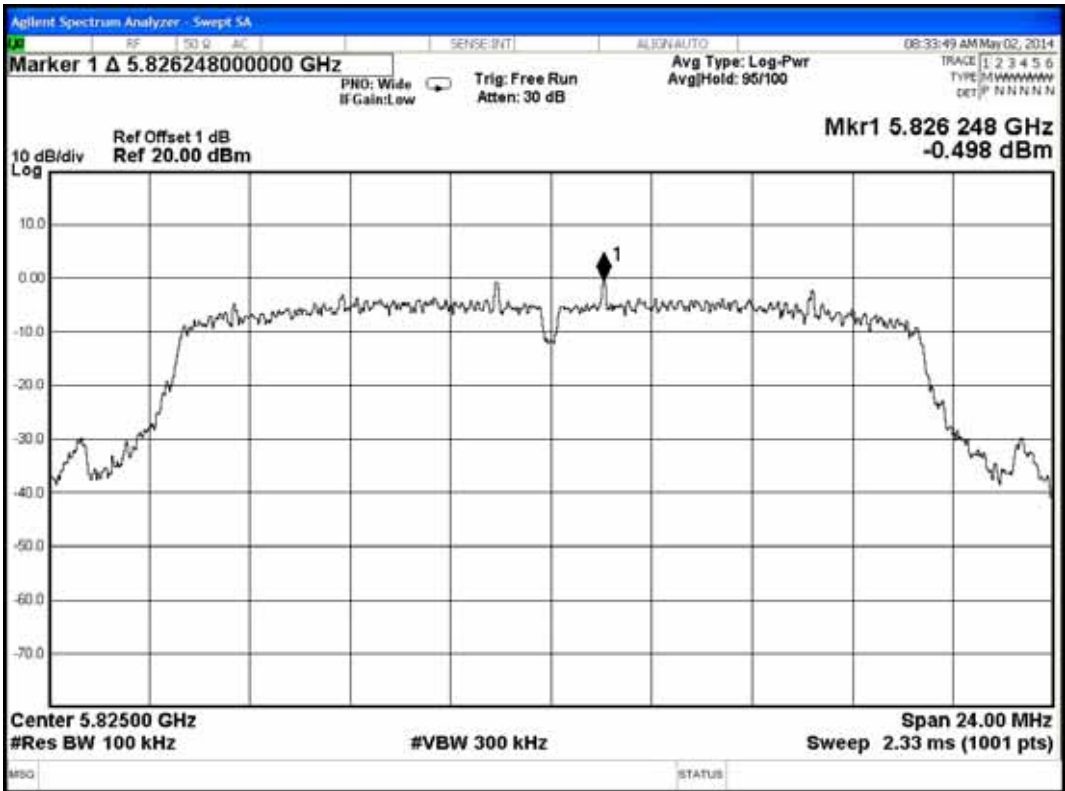


802.11n-HT20 (UNII Band II-2C), Frequency: 5700MHz



802.11n-HT20 (UNII Band III), Frequency: 5745MHz**802.11n-HT20 (UNII Band III), Frequency: 5785MHz**

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



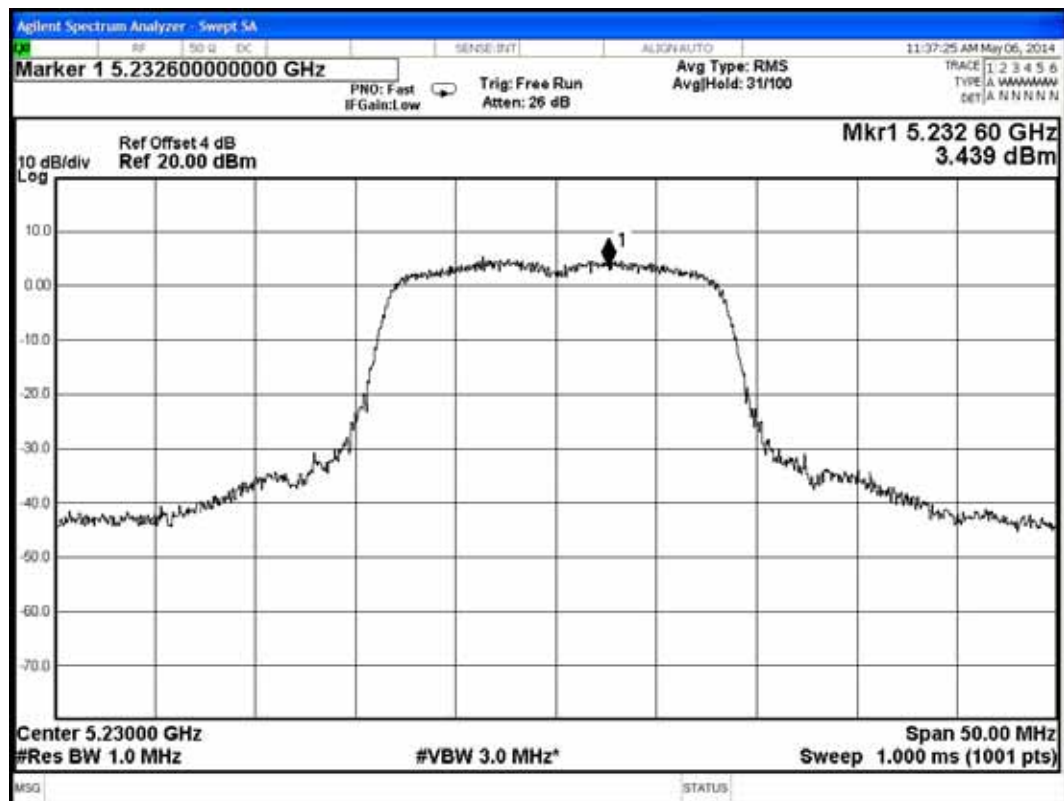
7.6.3. For 802.11n-HT40

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

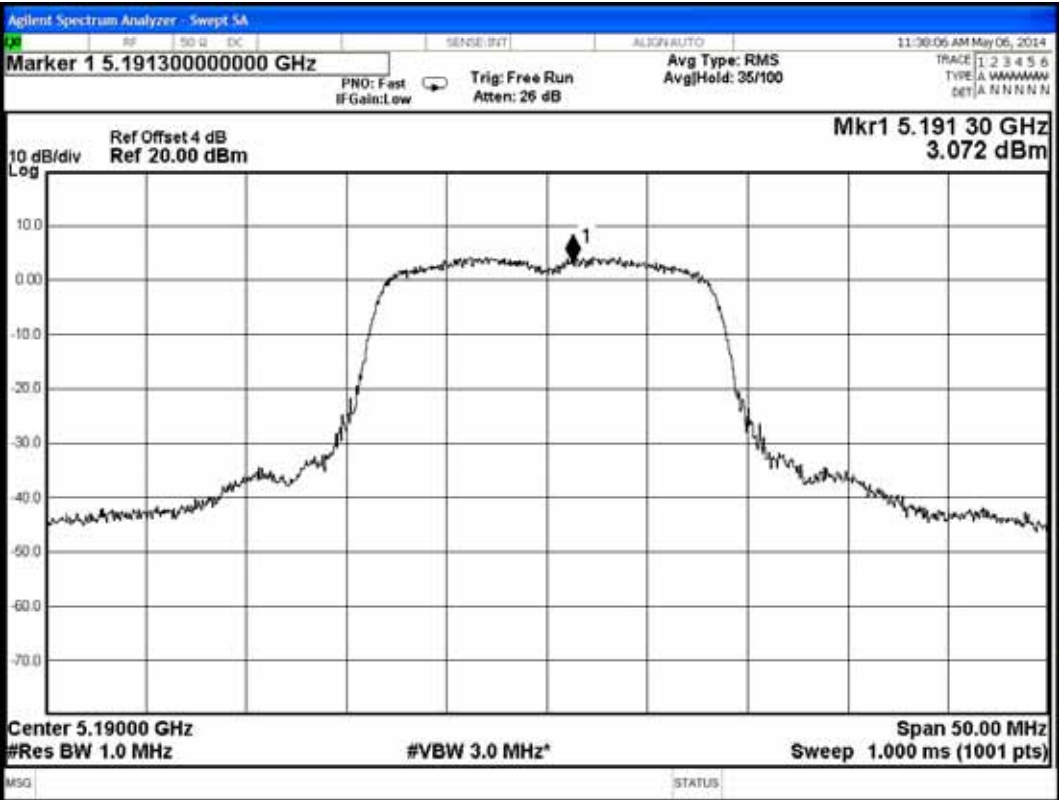
Mode	UNII Band	Channel	Frequency	Power Density (dBm/100kHz)	BWCF Factor 100kHz to 500kHz	Total Power Density
10.	UNII Band	CH 151	5755MHz	-3.131	6.989	3.858
11.	III	CH 159	5795MHz	-3.422		3.567

Limit: 30dBmNote: 1. BCW Factor= $10 \log (500/100)$

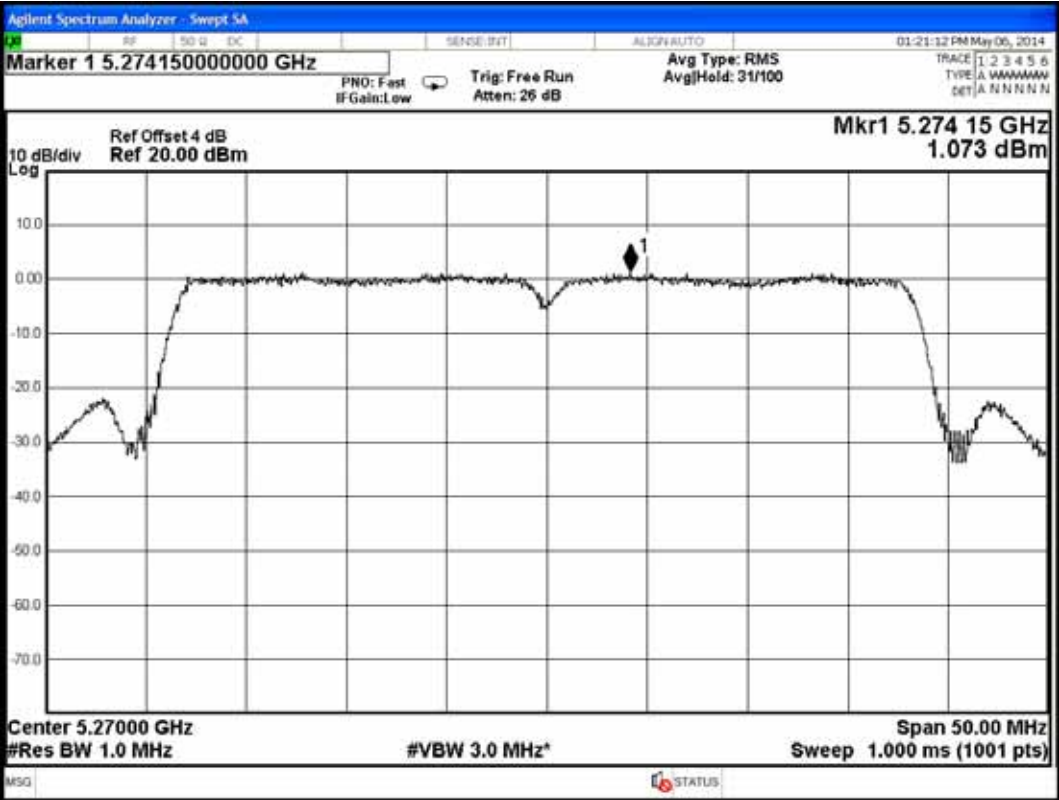
2. Total Power Density= Power Density + BWCF Factor

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

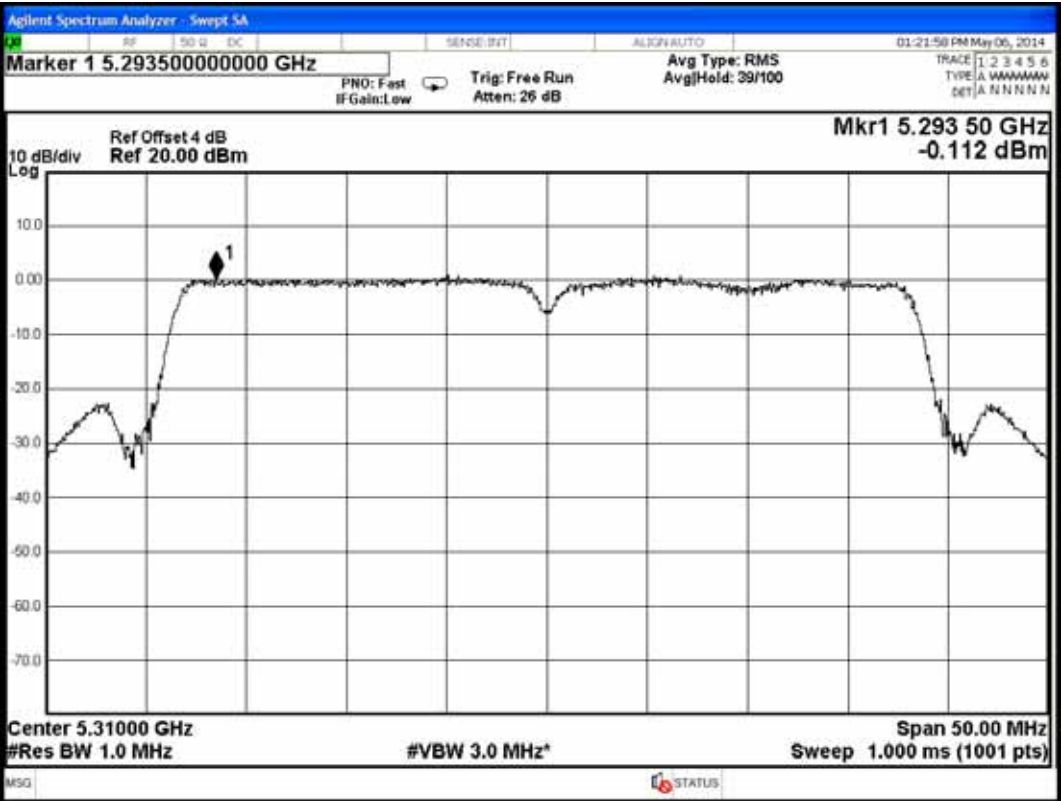
802.11n-HT40 (UNII Band I), Frequency: 5230MHz



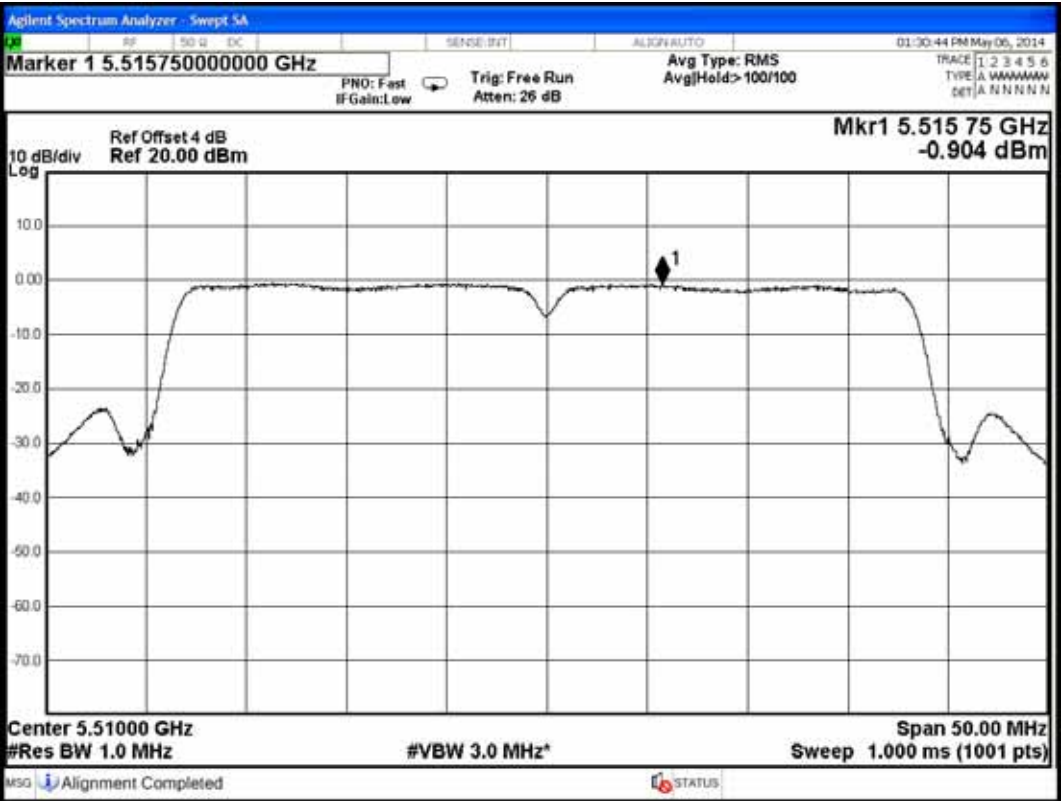
802.11n-HT40 (UNII Band II-2A), Frequency: 5270MHz



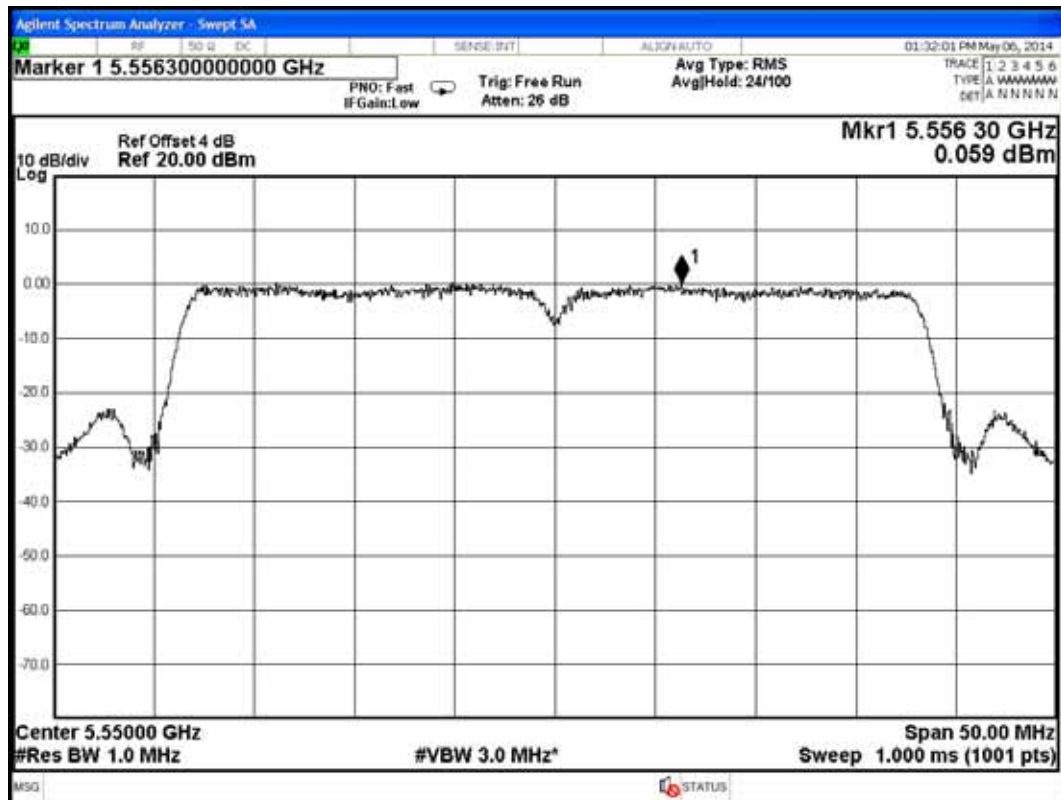
802.11n-HT40 (UNII Band II-2A), Frequency: 5310MHz



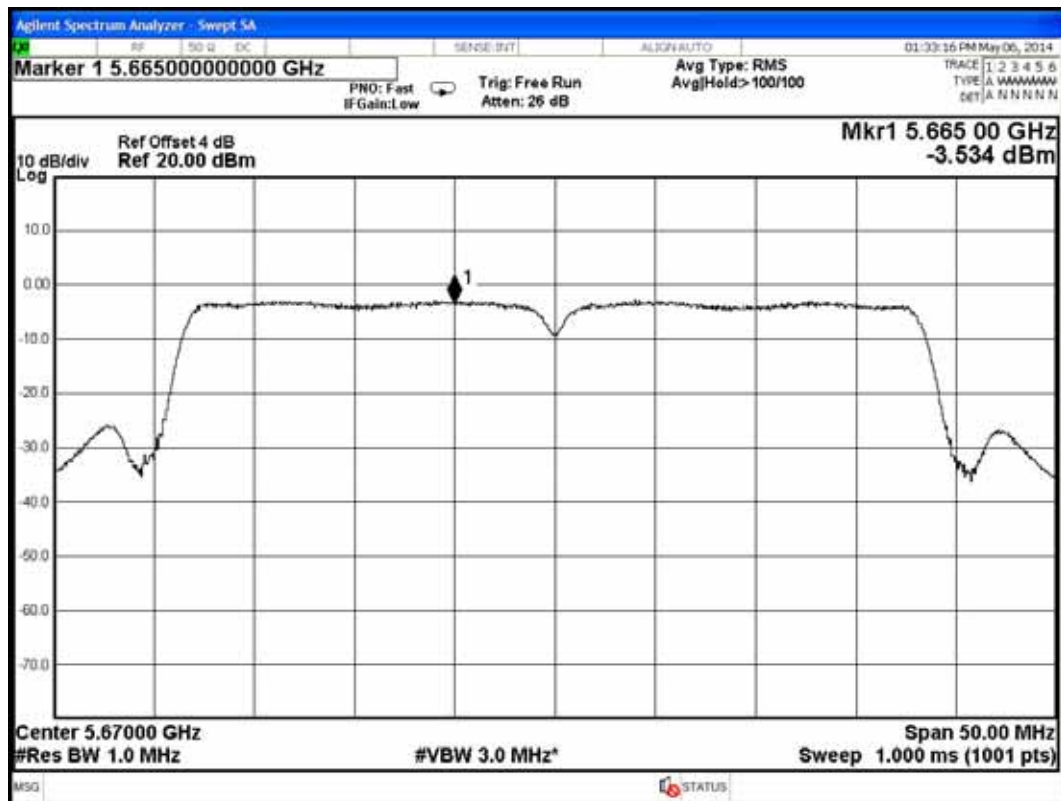
802.11n-HT40 (UNII Band II-2C), Frequency: 5510MHz

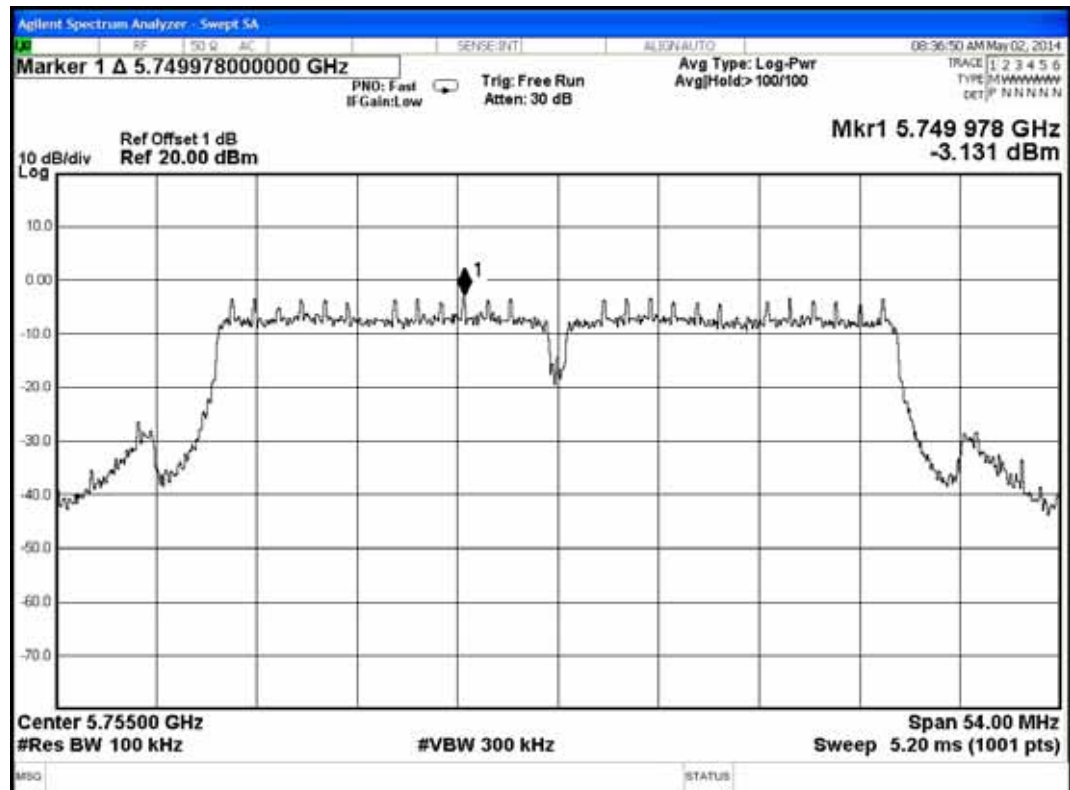
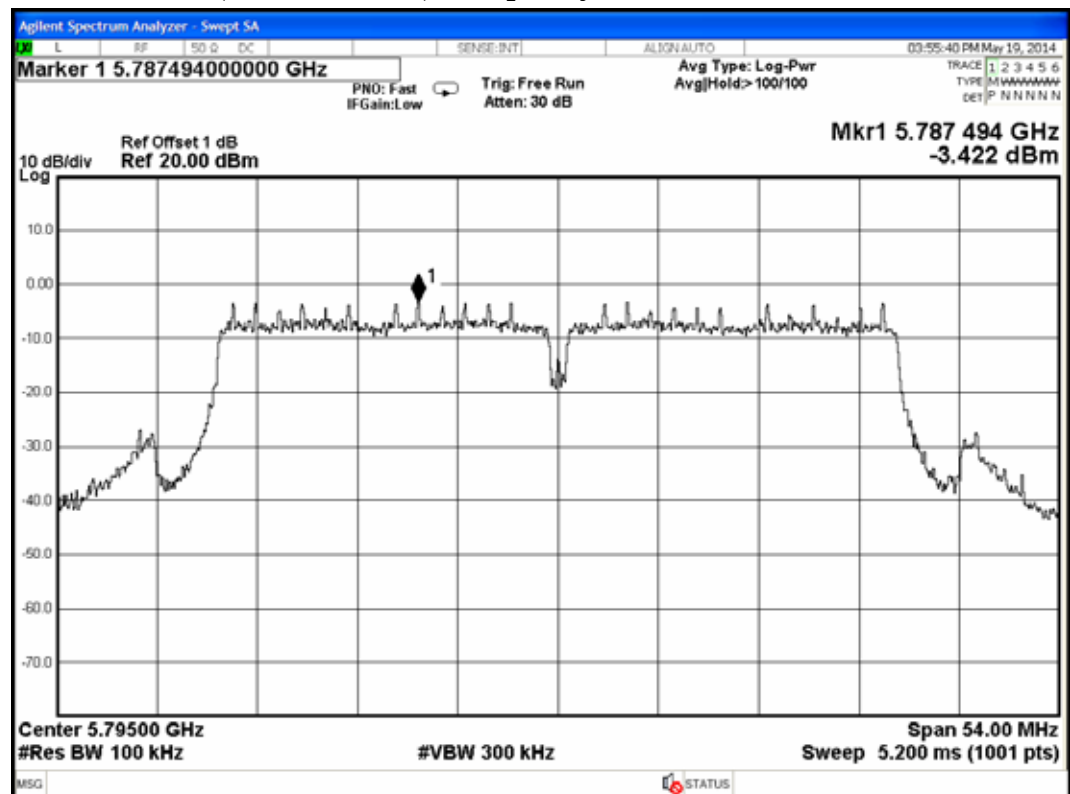


802.11n-HT40 (UNII Band II-2C), Frequency: 5550MHz



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 search 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 $10\log(N)$ shall be added, where N is the number of output.

8.6. Test Results

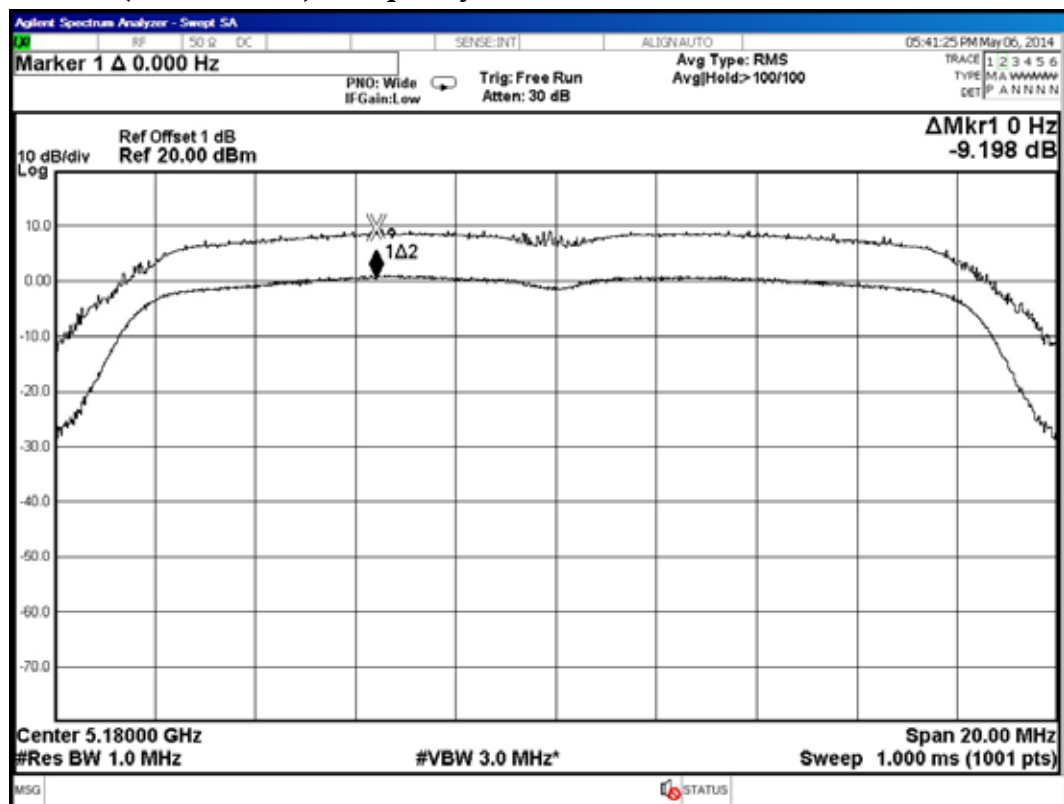
PASSED. All the test results are attached in next pages.

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

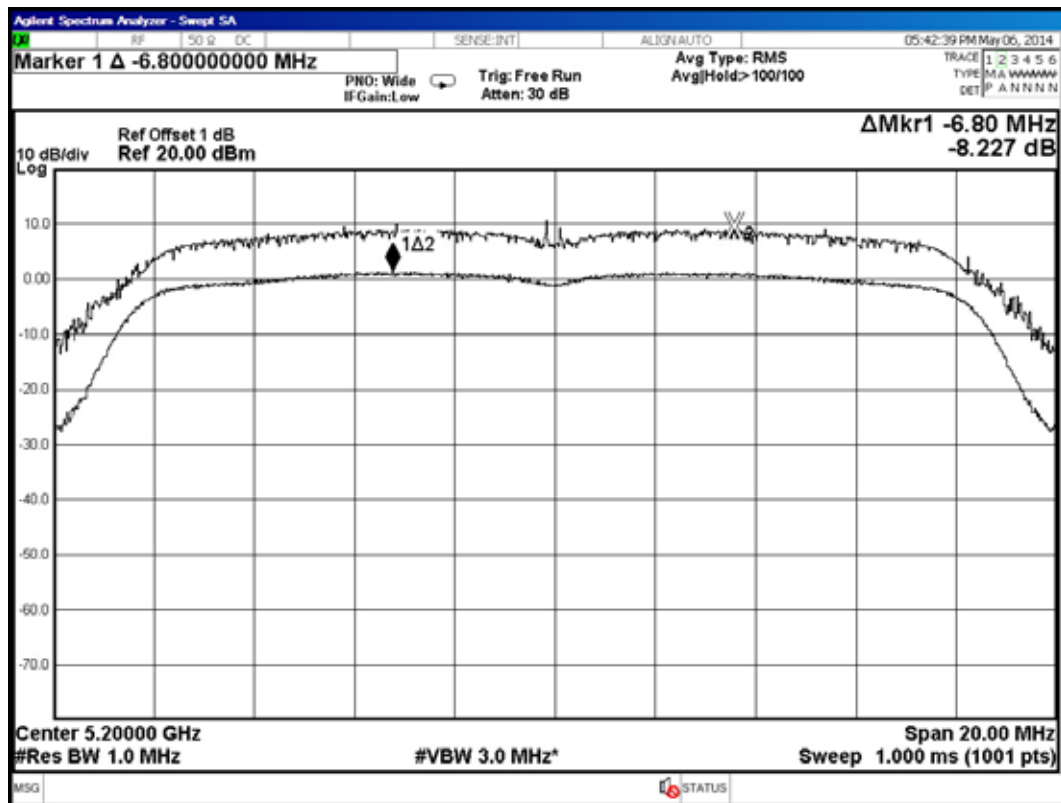
8.6.1. For 802.11a

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

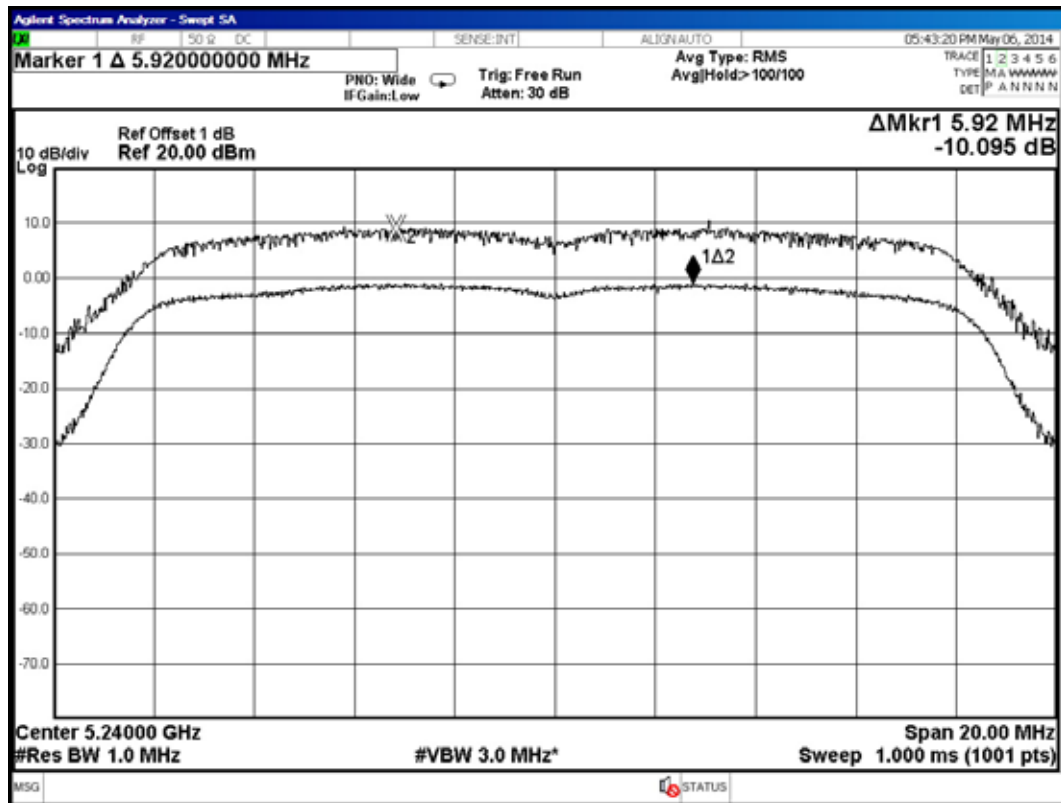
802.11a (UNII Band I), Frequency: 5180MHz



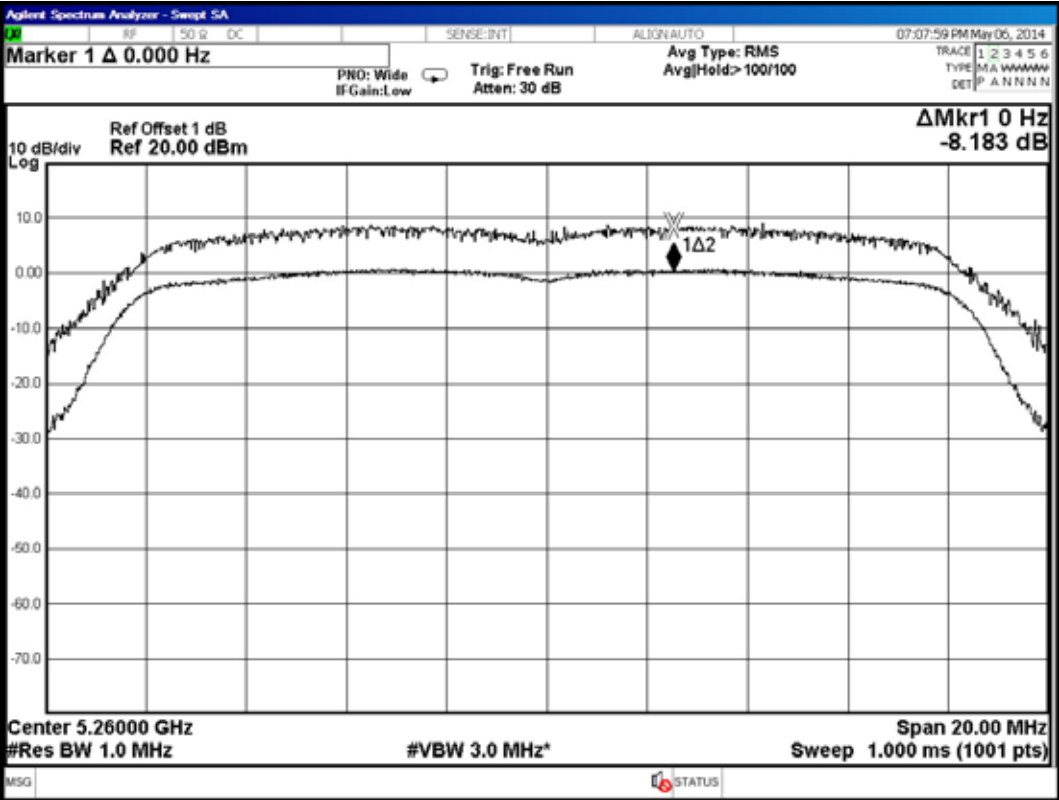
802.11a (UNII Band I), Frequency: 5200MHz



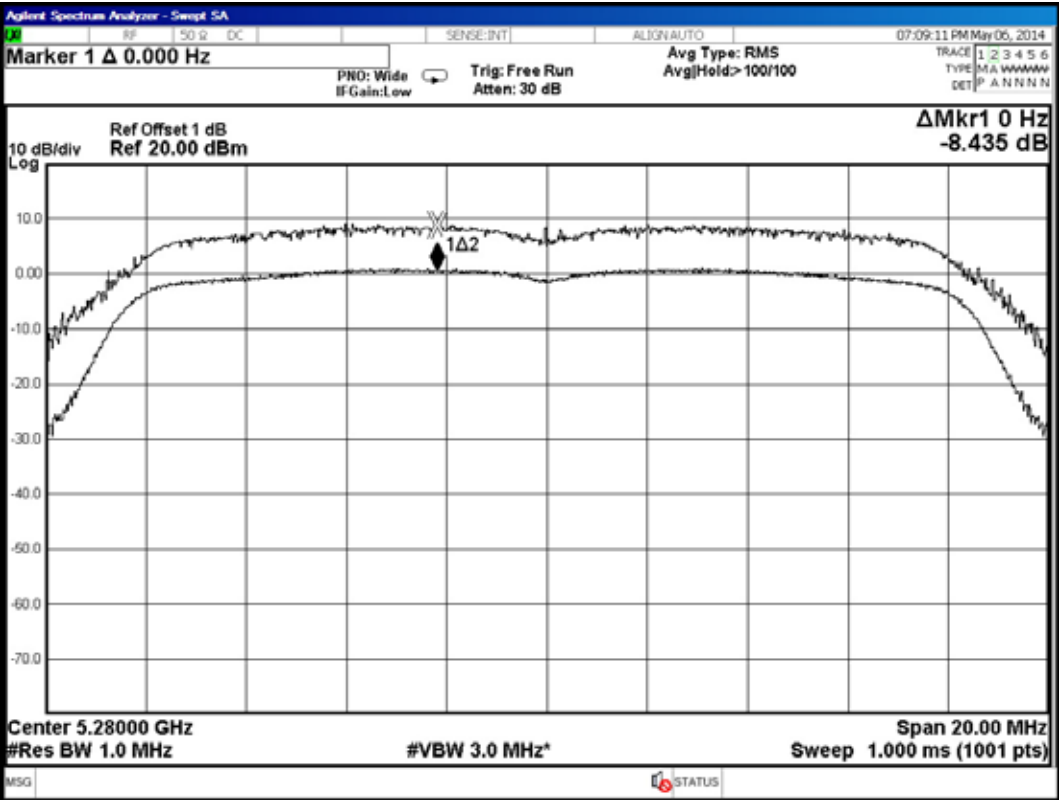
802.11a (UNII Band I), Frequency: 5240MHz



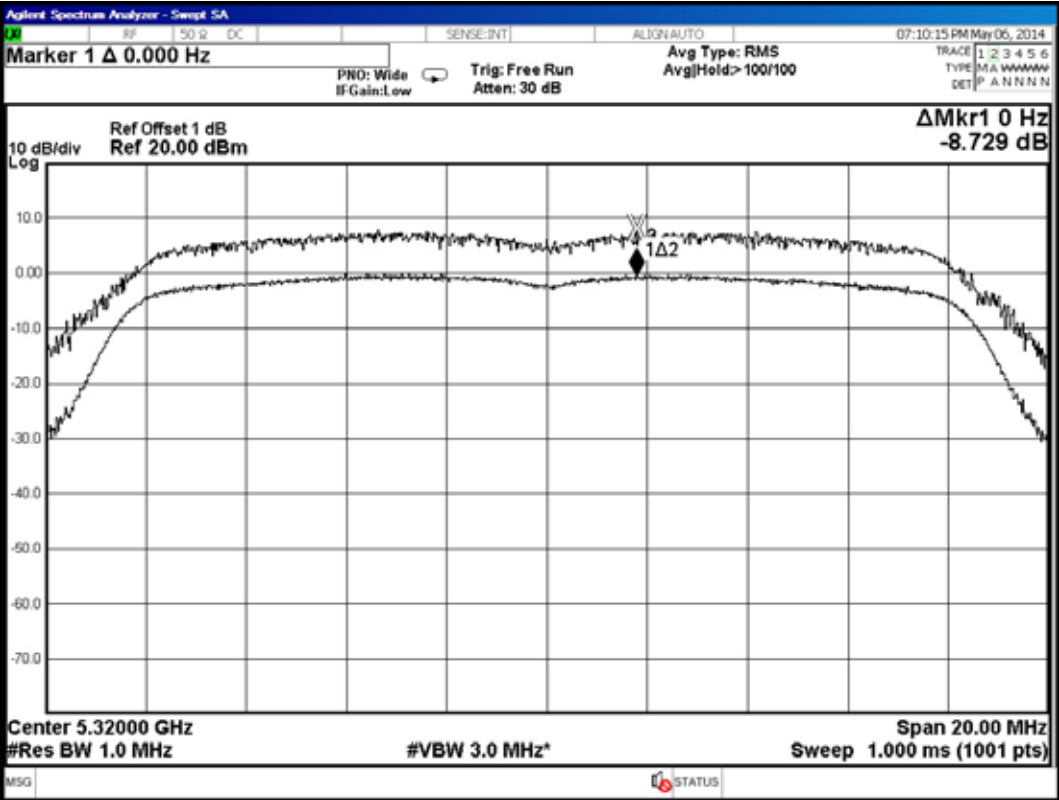
802.11a (UNII Band II), Frequency: 5260MHz



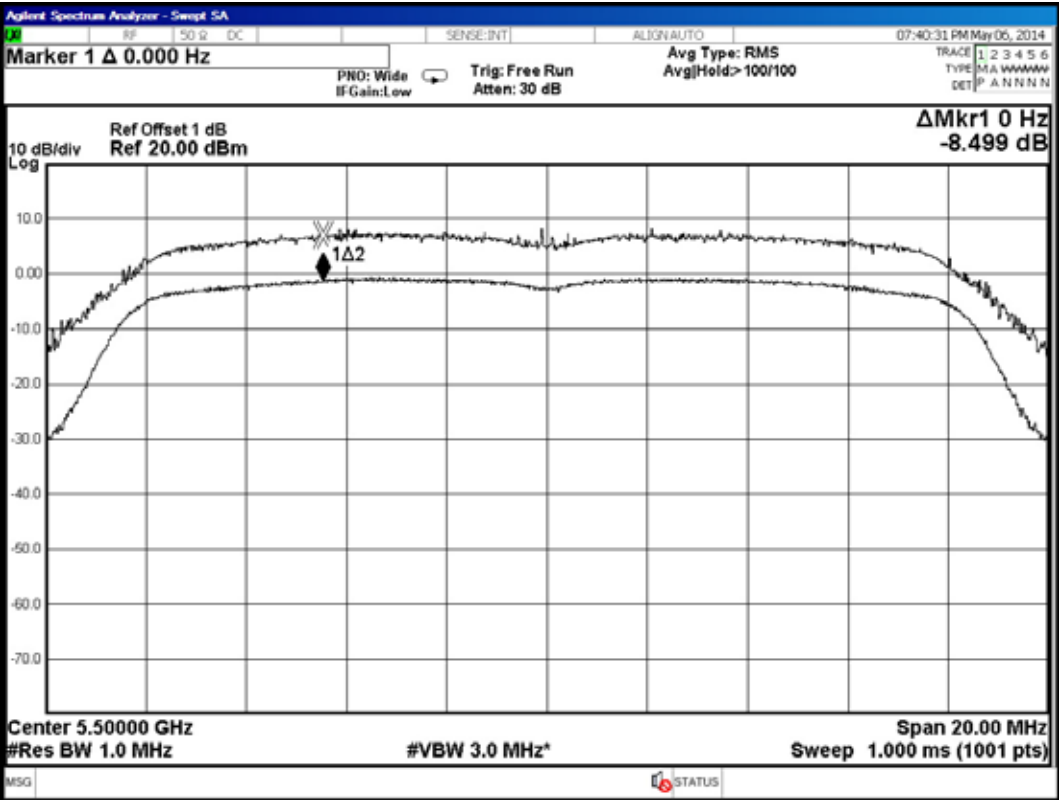
802.11a (UNII Band II), Frequency: 5280MHz



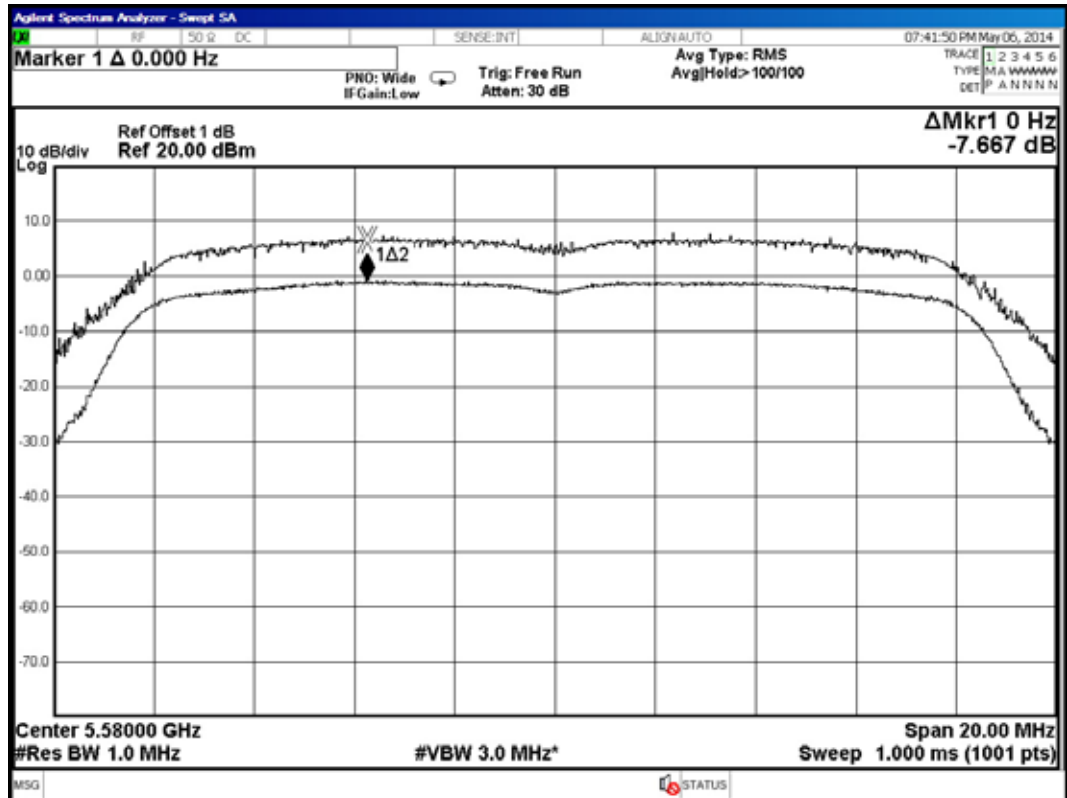
802.11a (UNII Band II), Frequency: 5320MHz



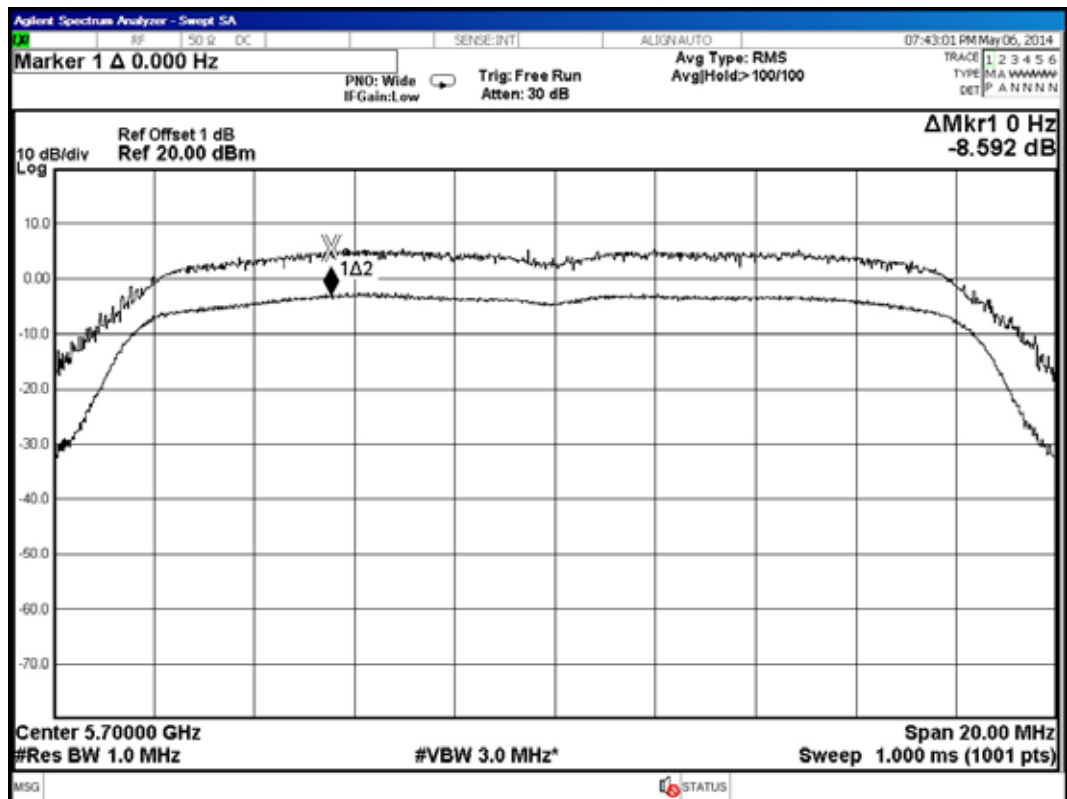
802.11a (UNII Band III), Frequency: 5500MHz



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



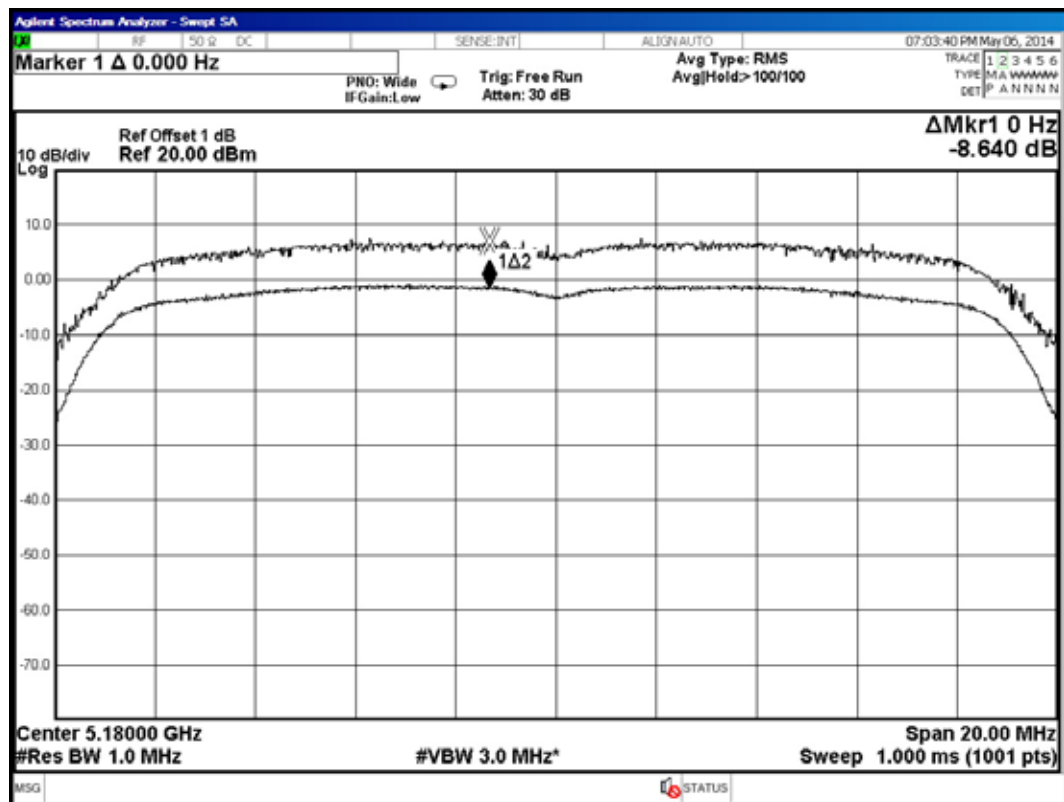
802.11a (UNII Band III), Frequency: 5700MHz



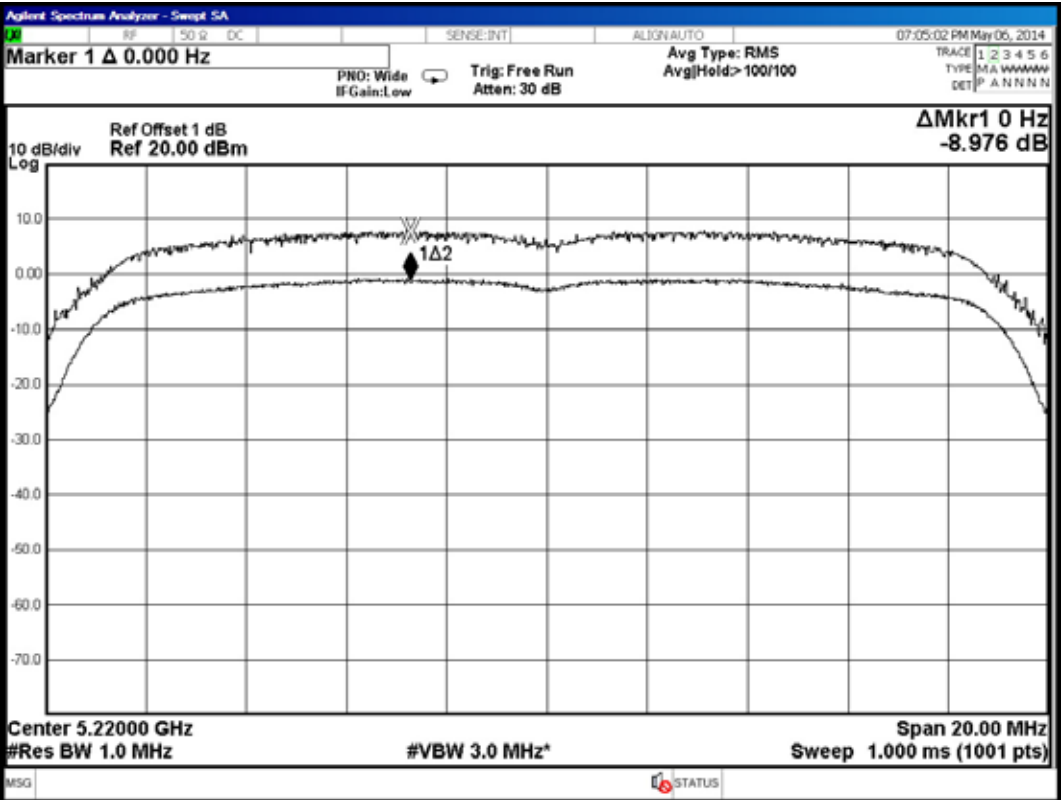
8.6.2. For 802.11n-HT20

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

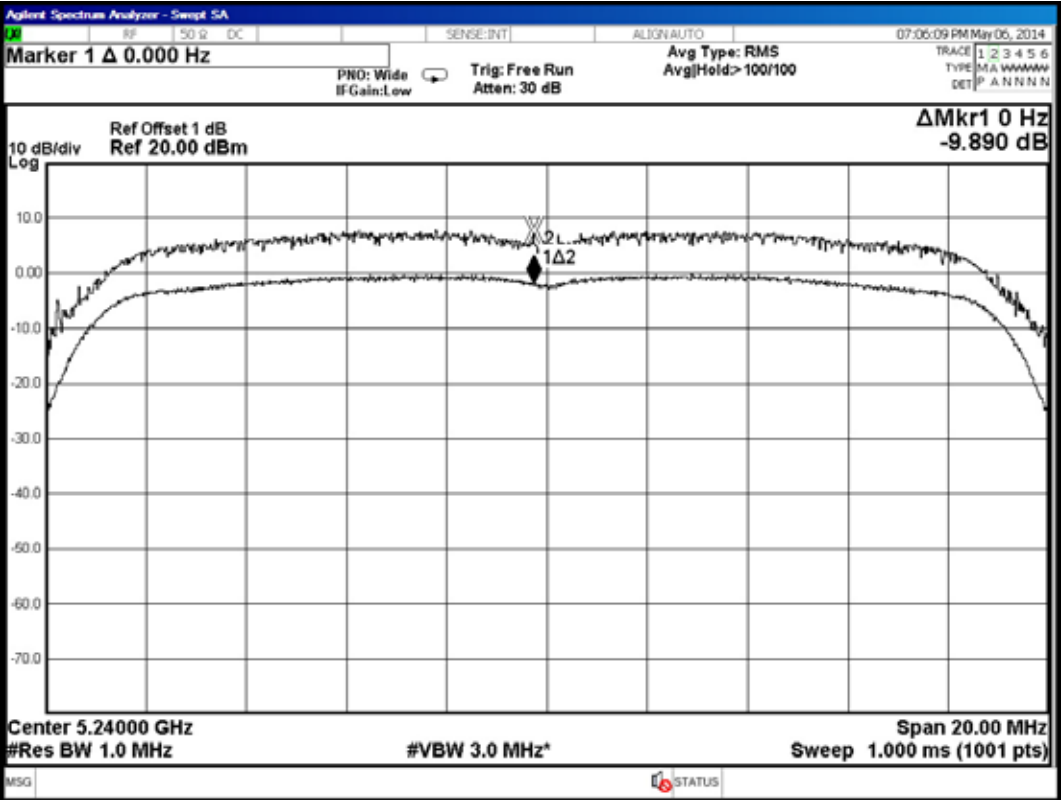
802.11n-HT20 (UNII Band I), Frequency: 5180MHz



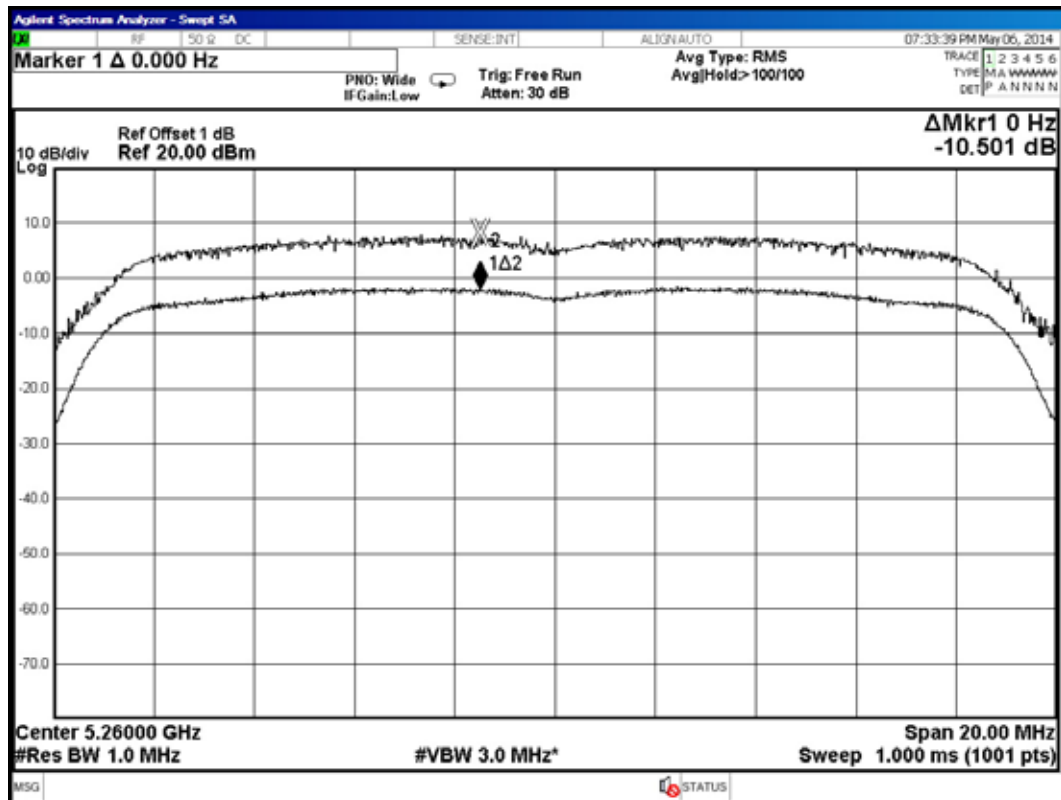
802.11n-HT20 (UNII Band I), Frequency: 5200MHz



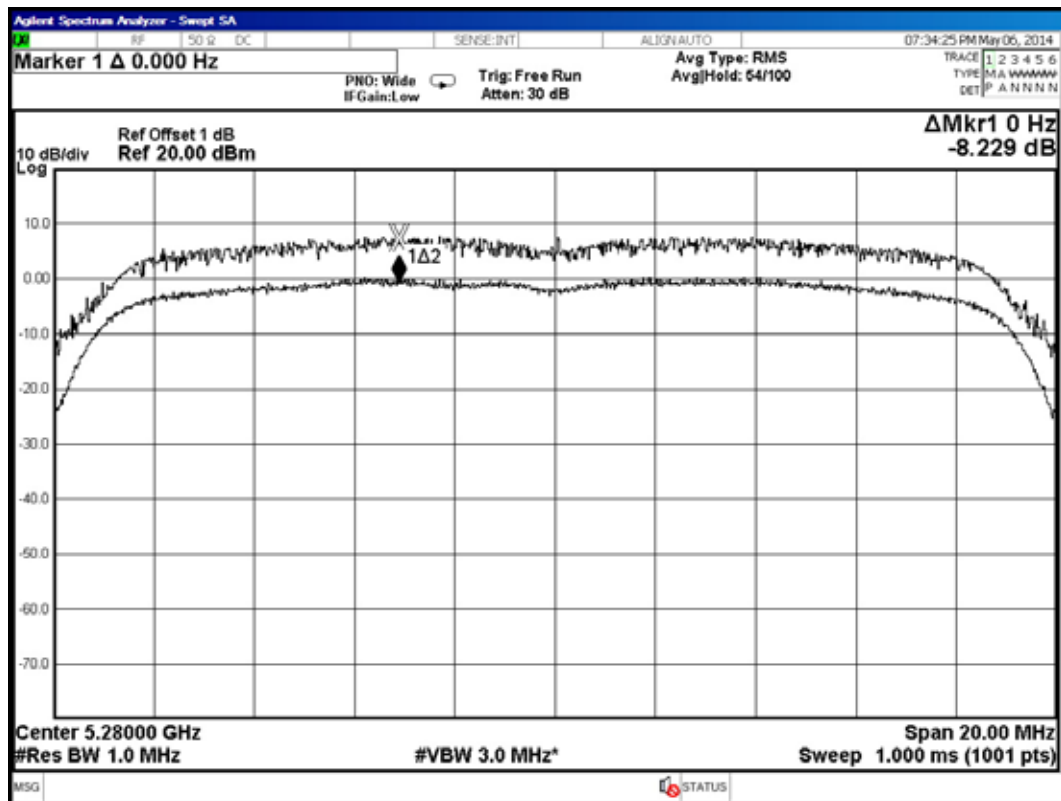
802.11n-HT20 (UNII Band I), Frequency: 5240MHz



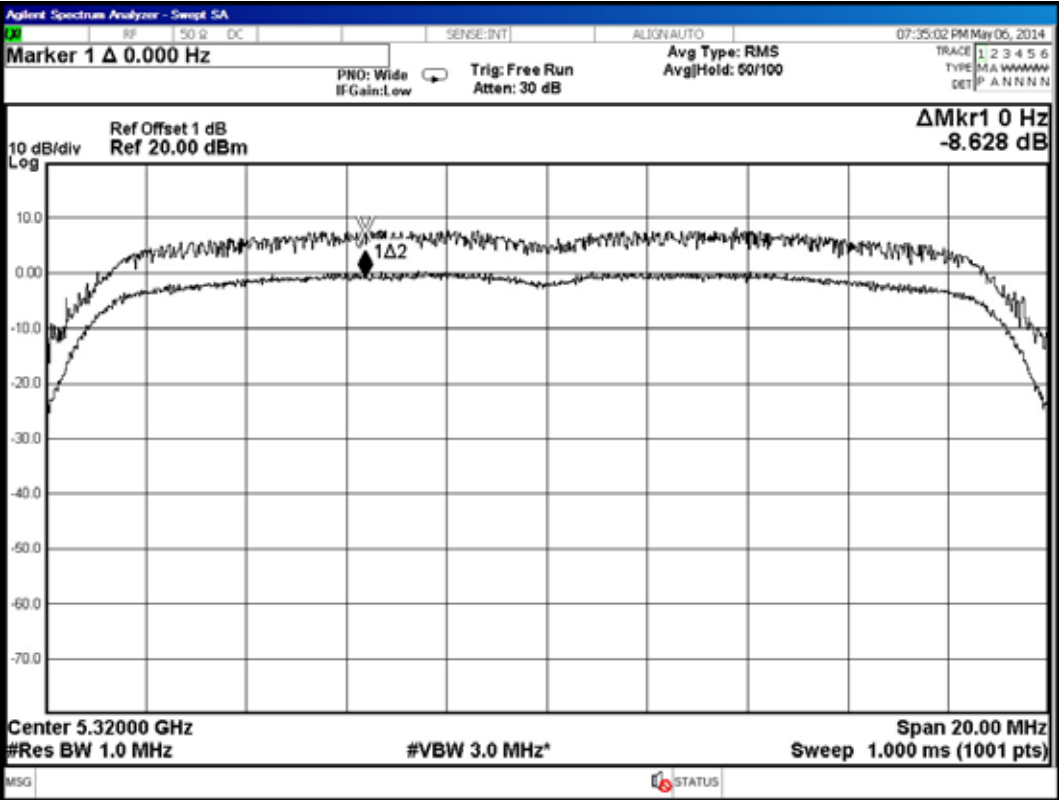
802.11n-HT20 (UNII Band II), Frequency: 5260MHz



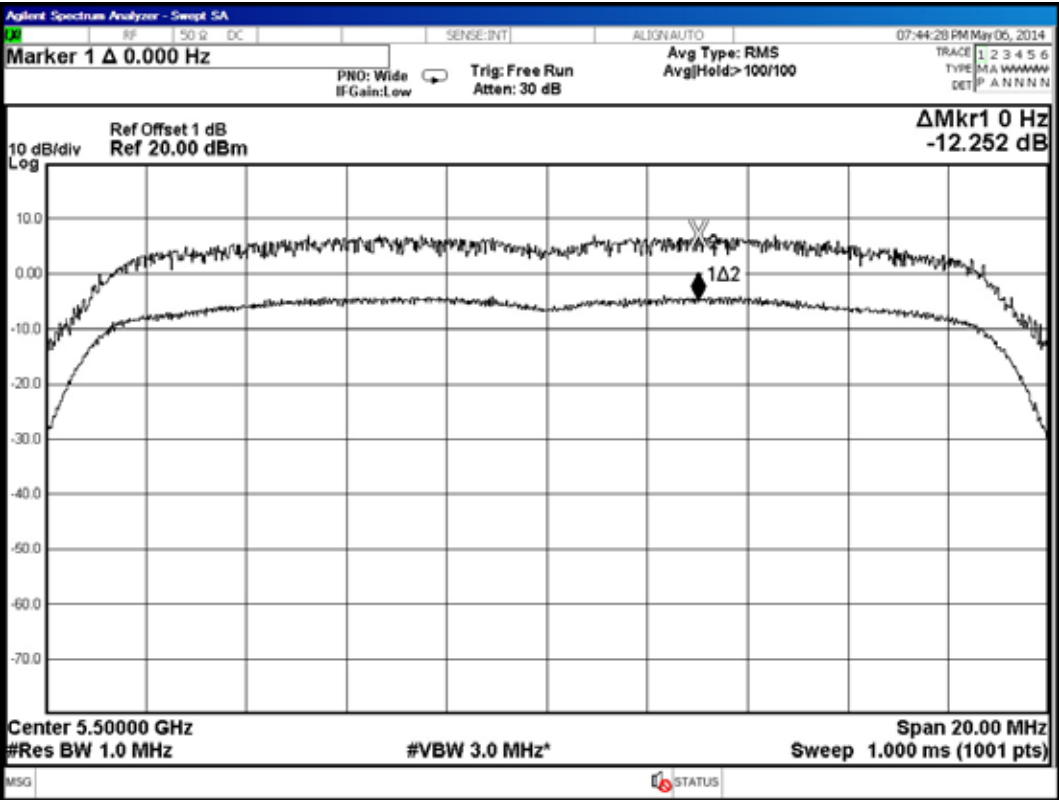
802.11n-HT20 (UNII Band II), Frequency: 5280MHz



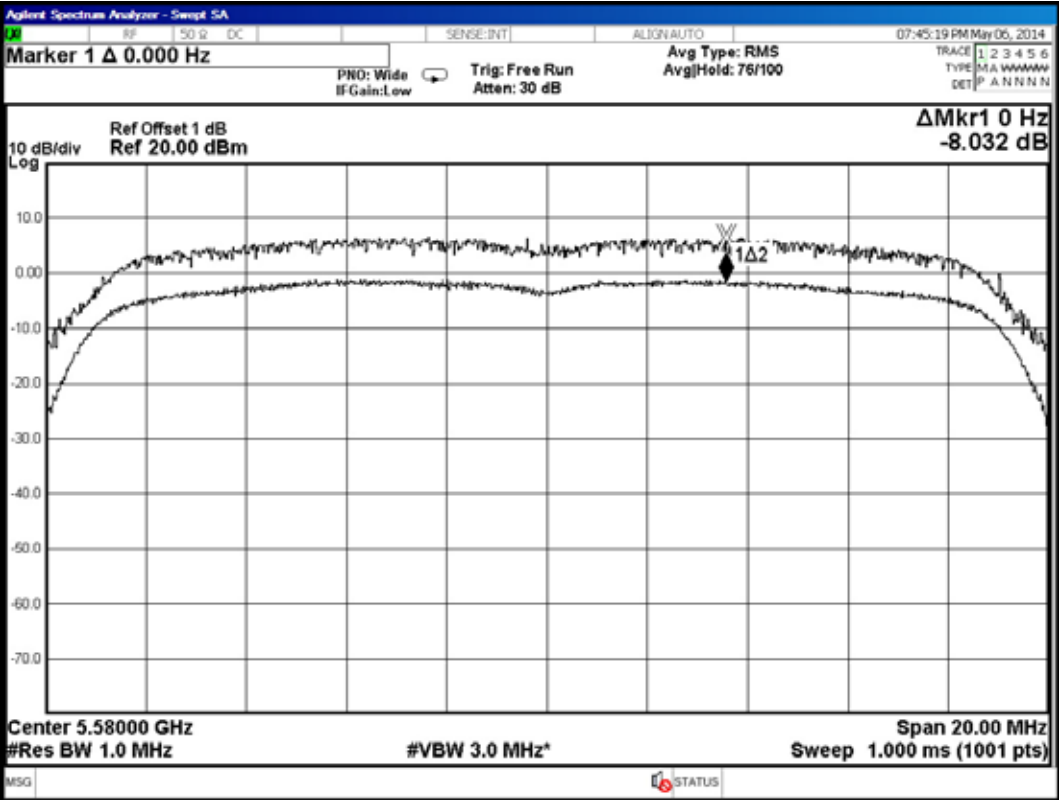
802.11n-HT20 (UNII Band II), Frequency: 5320MHz



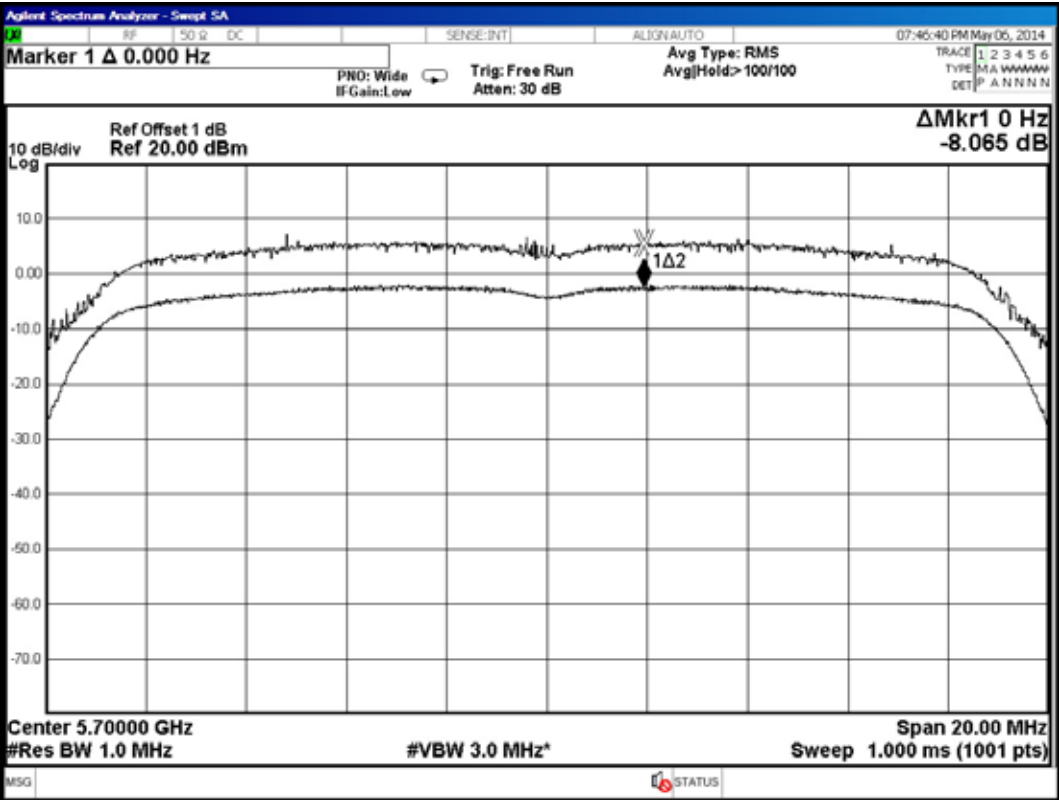
802.11n-HT20 (UNII Band III), Frequency: 5500MHz



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



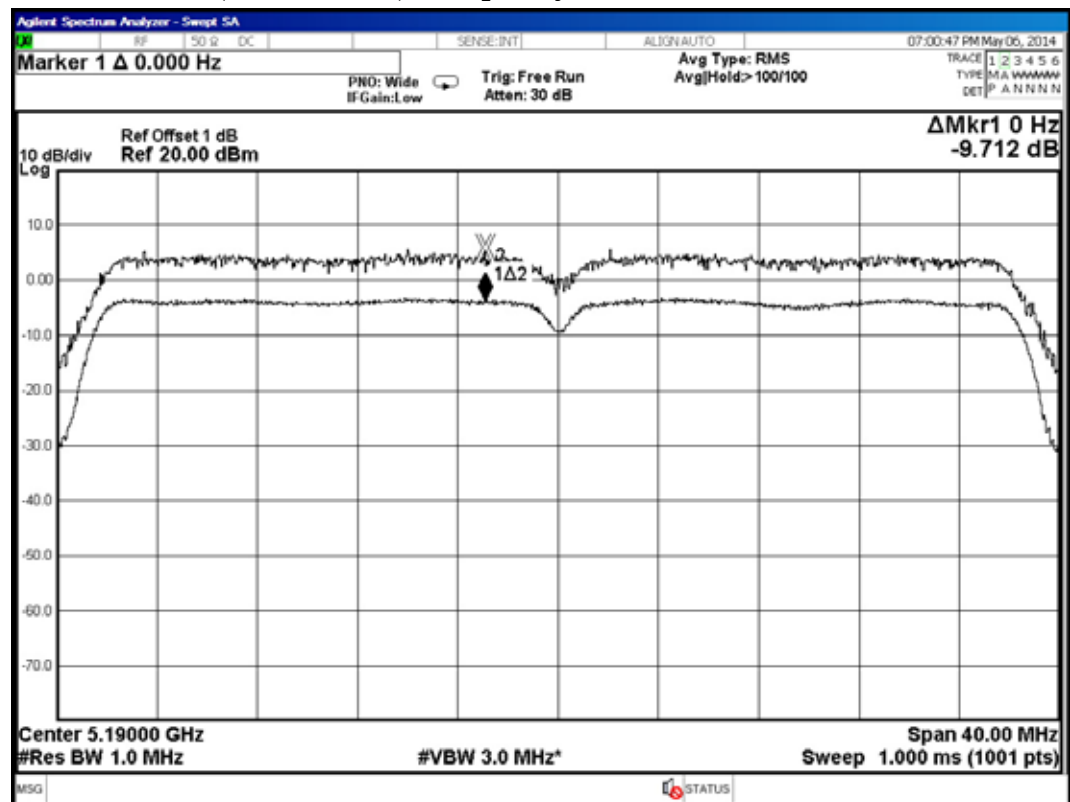
802.11n-HT20 (UNII Band III), Frequency: 5700MHz



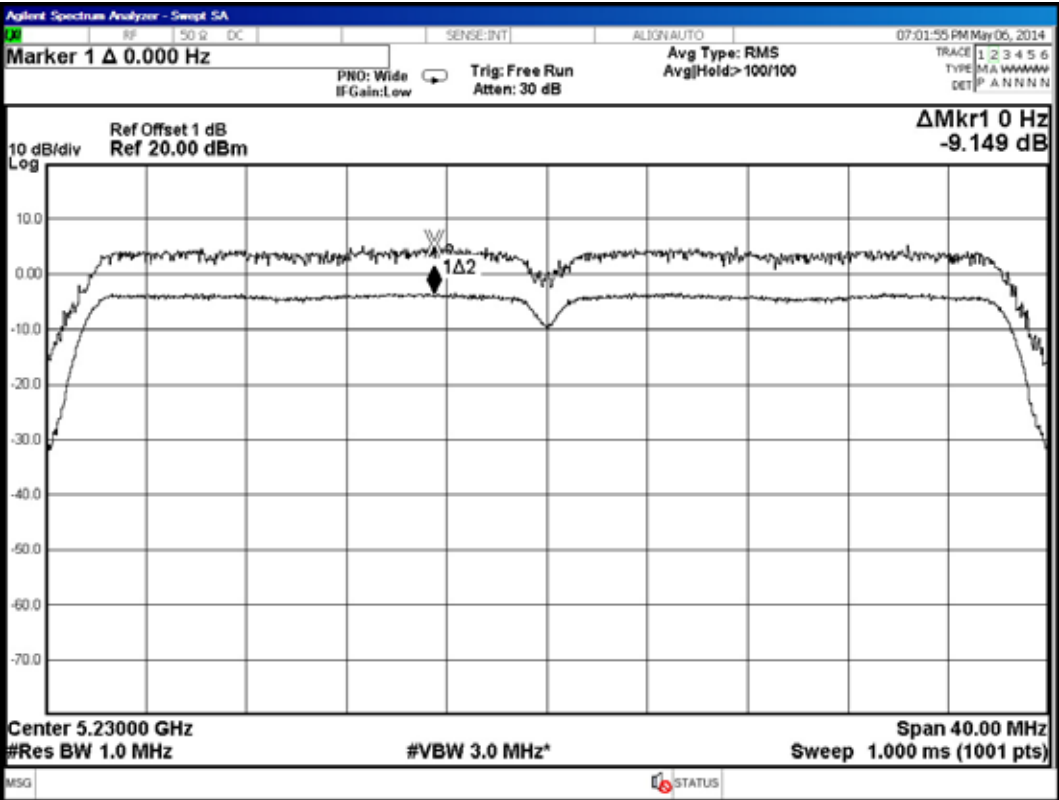
8.6.3. For 802.11n-HT40

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

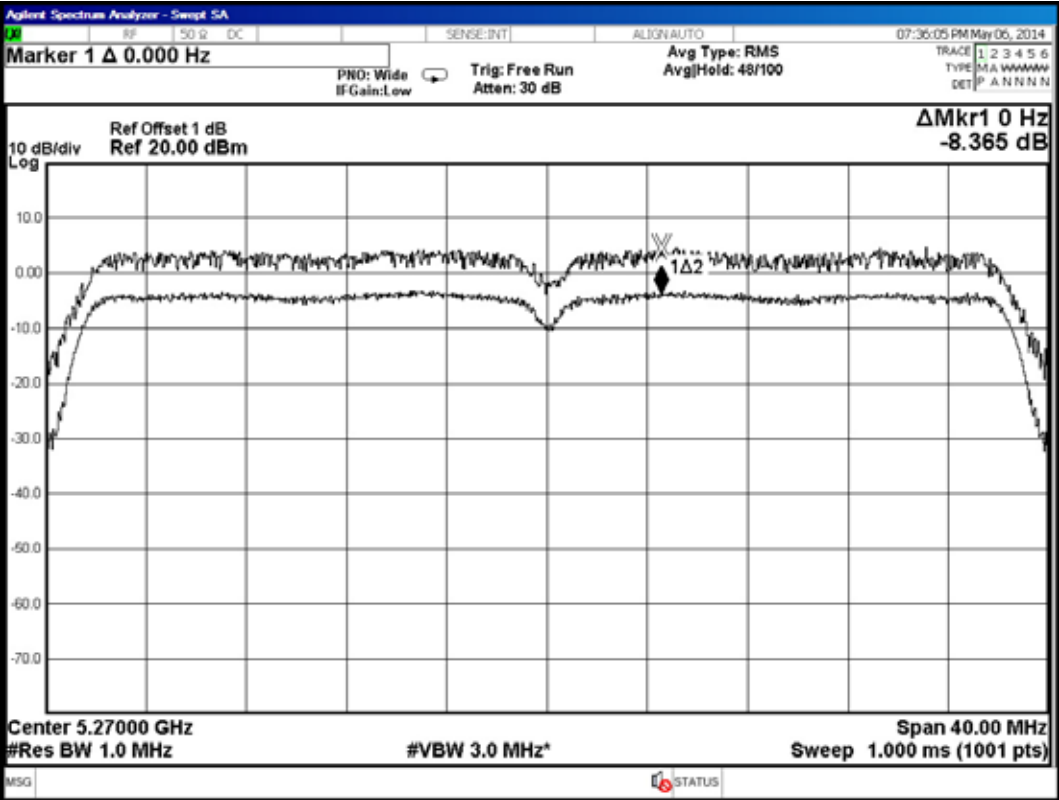
802.11n-HT40 (UNII Band I), Frequency: 5190MHz



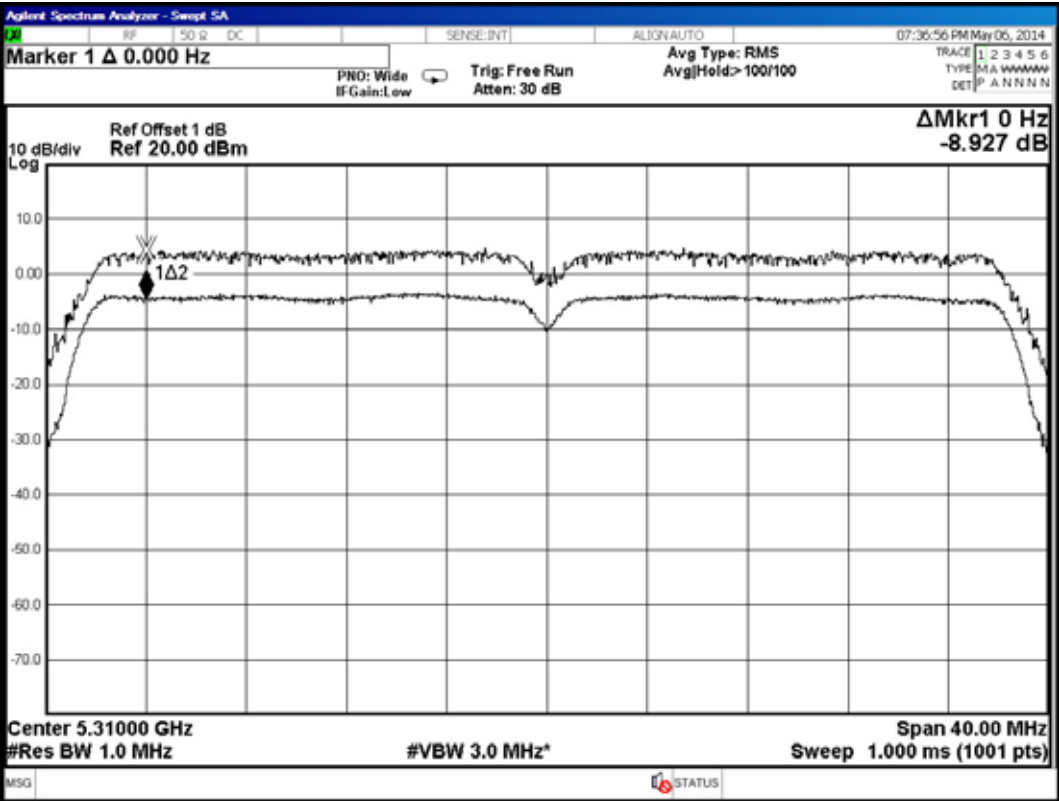
802.11n-HT40 (UNII Band I), Frequency: 5230MHz



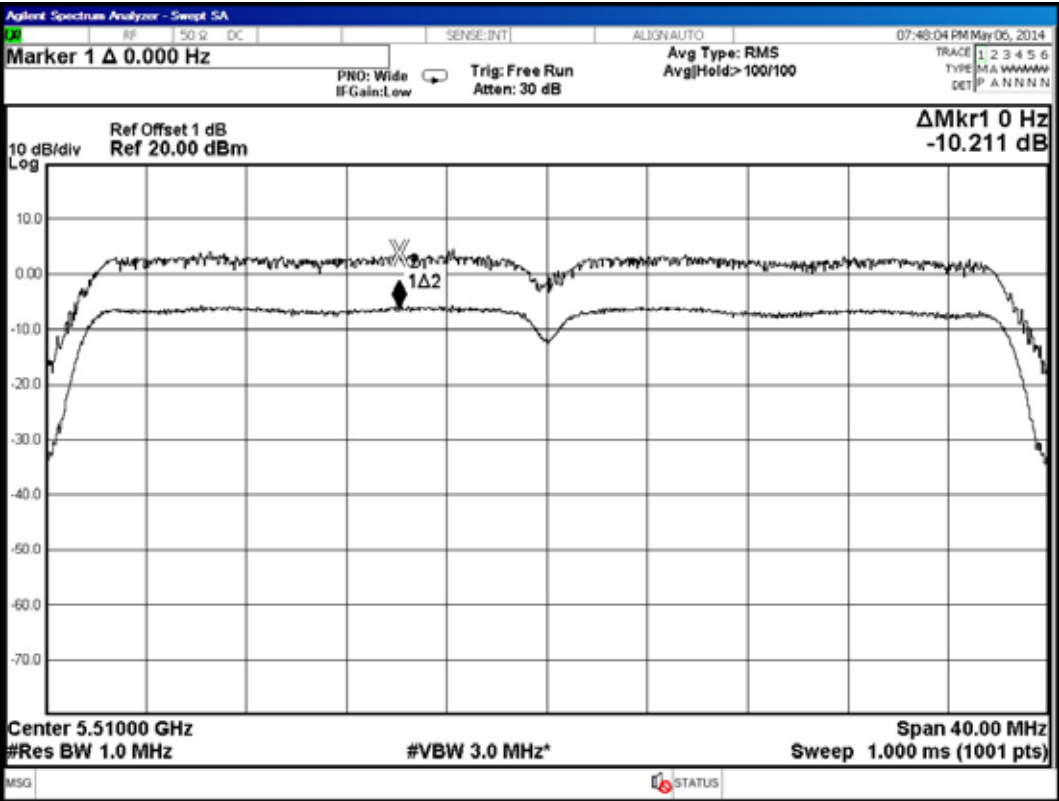
802.11n-HT40 (UNII Band II), Frequency: 5270MHz



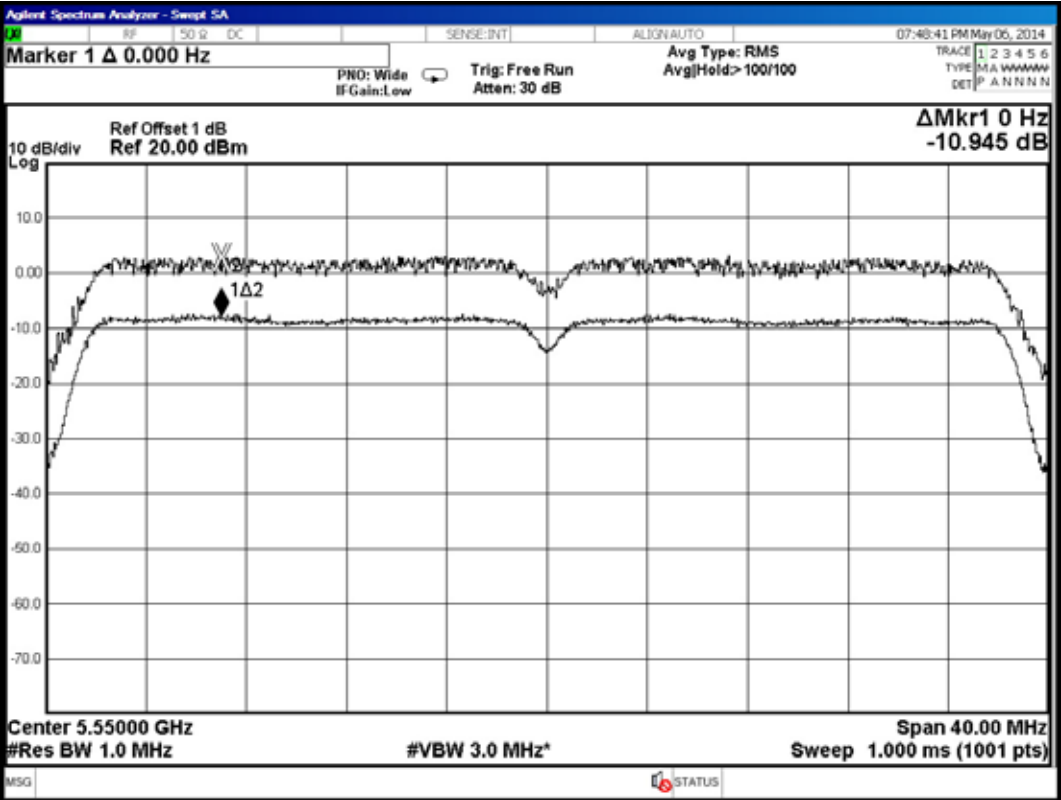
802.11n-HT40 (UNII Band II), Frequency: 5310MHz



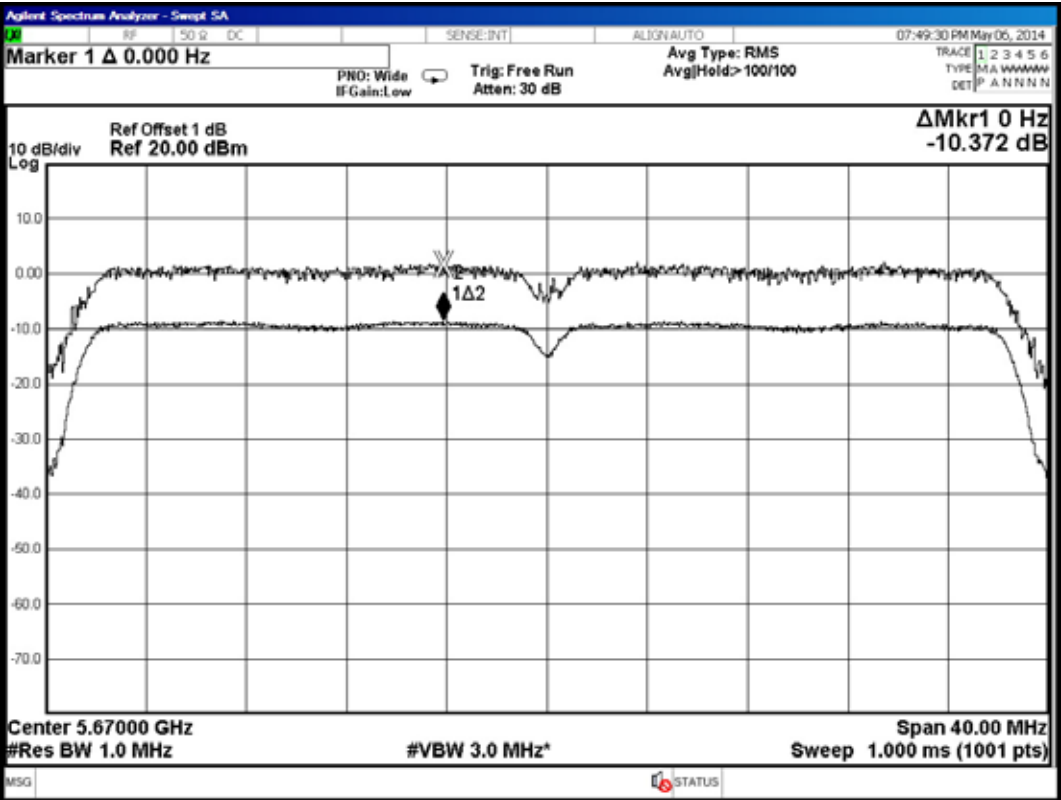
802.11n-HT40 (UNII Band III), Frequency: 5510MHz



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



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



9. DEVIATION TO TEST SPECIFICATIONS

【NONE】