

8.3 MAXIMUM PEAK POWER DENSITY

8.3.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to 789033 D02 Section II(F)

8.3.2 Conformance Limit

■ For the band 5.15-5.25 GHz,

(a) (1) (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(a) (1) (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(a) (1) (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(a) (1) (iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■ For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

(b) (2) the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

■ For the band 5.725-5.85 GHz

(a) (3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.3.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.3.4 Test Procedure

Methods refer to FCC KDB 789033

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.I.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/RBW)$ to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/RBW)$ to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections

5.c) and 5.d) above, since RBW=100 KHz is available on nearly all spectrum analyzers.

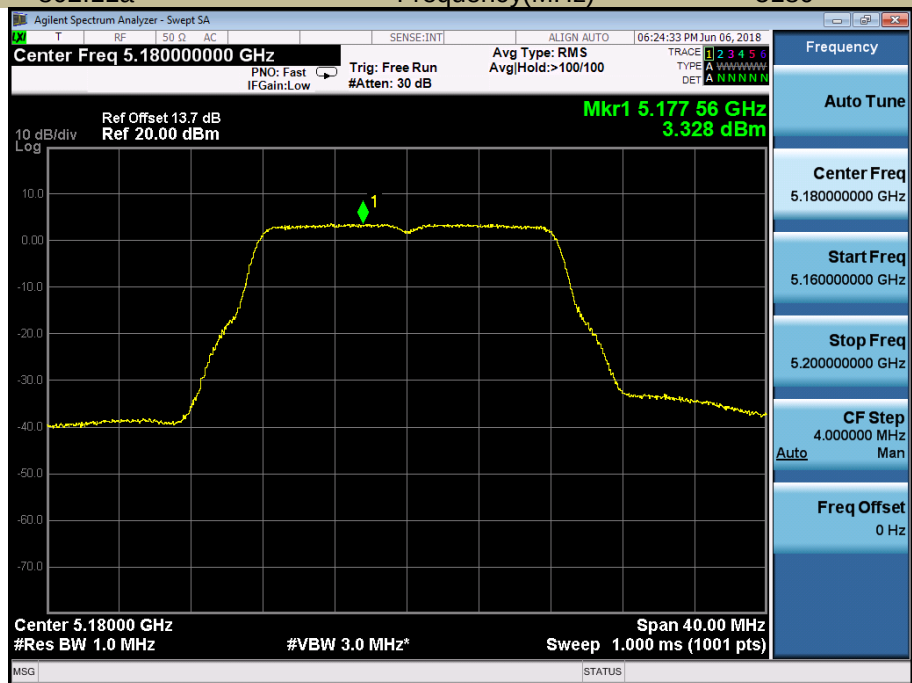
8.3.5 Test Results

1T1R - Antenna A

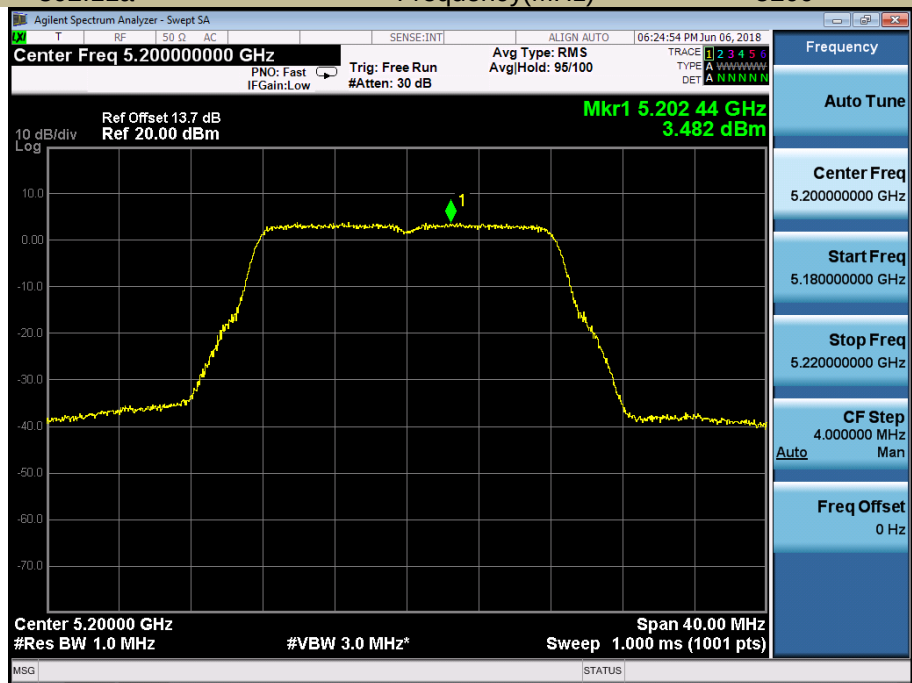
5150-5250MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	3.328	11
	5200	3.482	11
	5240	2.926	11
802.11n-HT20	5180	3.128	11
	5200	3.038	11
	5240	2.435	11
802.11ac(VHT20)	5180	0.152	11
	5200	0.014	11
	5240	-0.438	11
802.11n-HT40	5190	-0.476	11
	5230	-1.089	11
802.11ac(VHT40)	5190	-0.450	11
	5230	-0.908	11
802.11ac(VHT80)	5210	-4.528	11

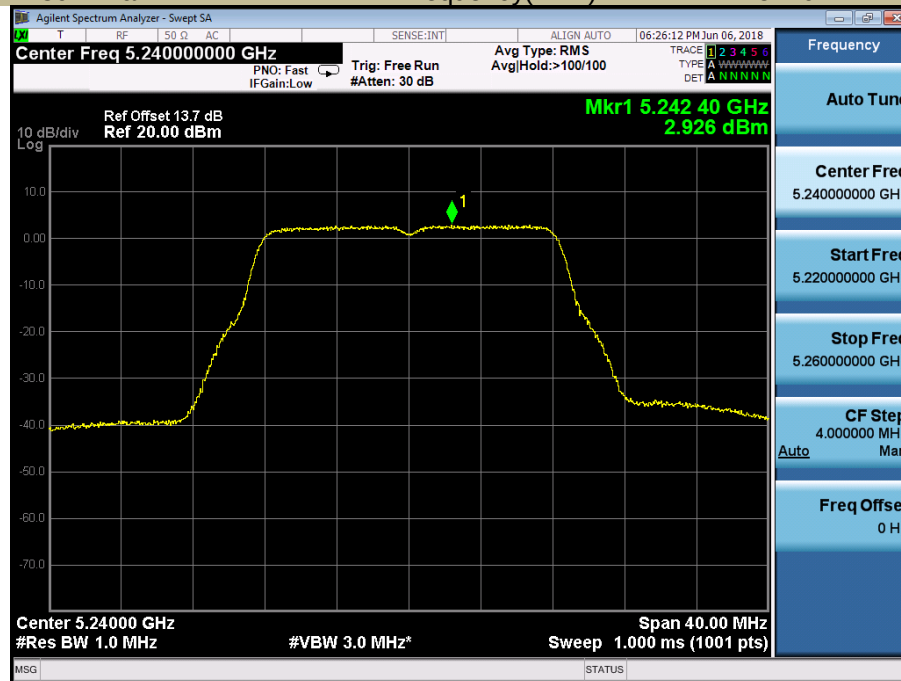
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5180



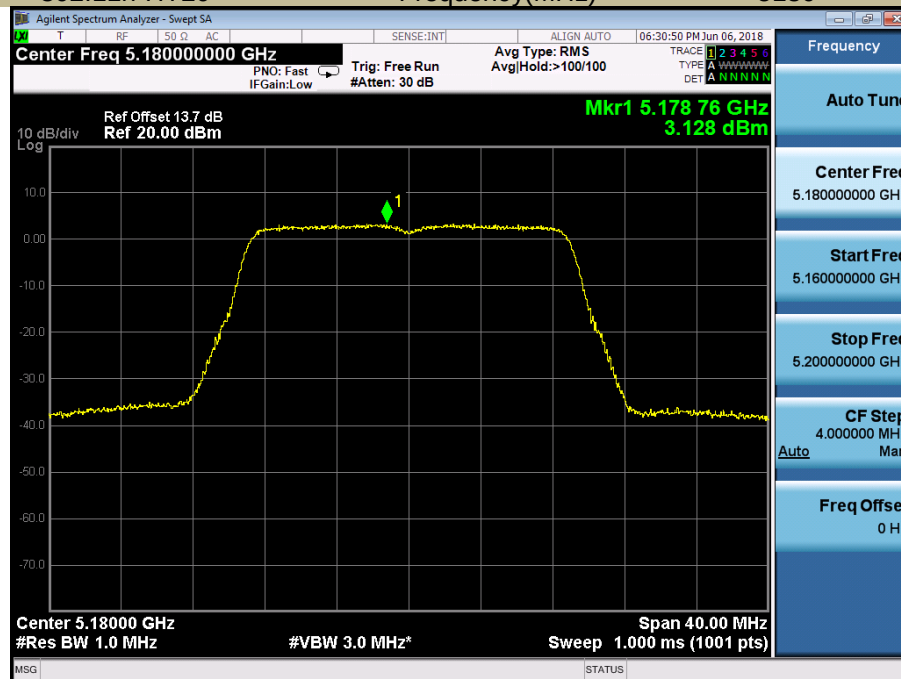
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5200



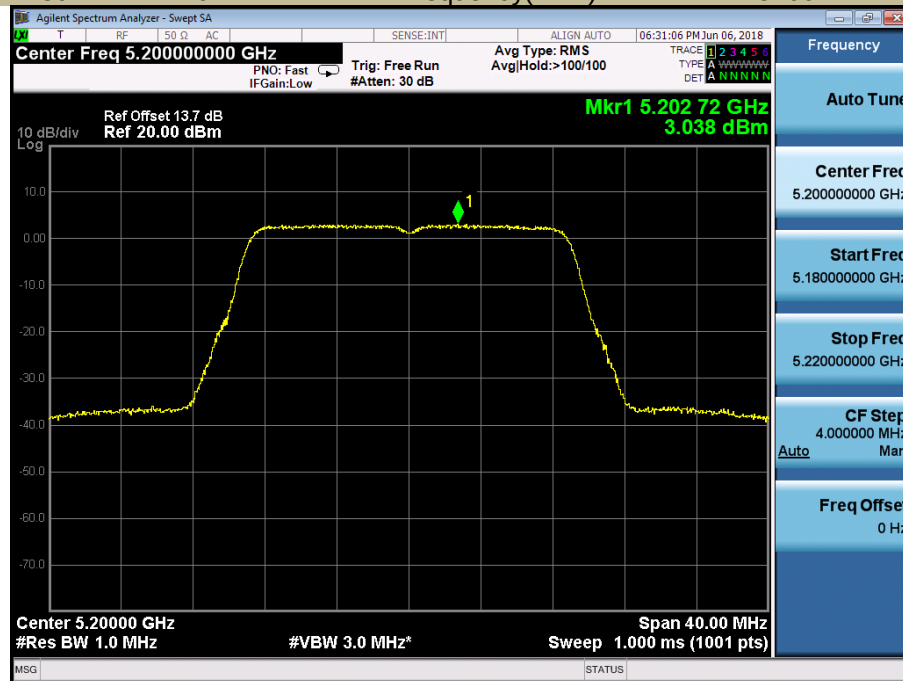
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5240



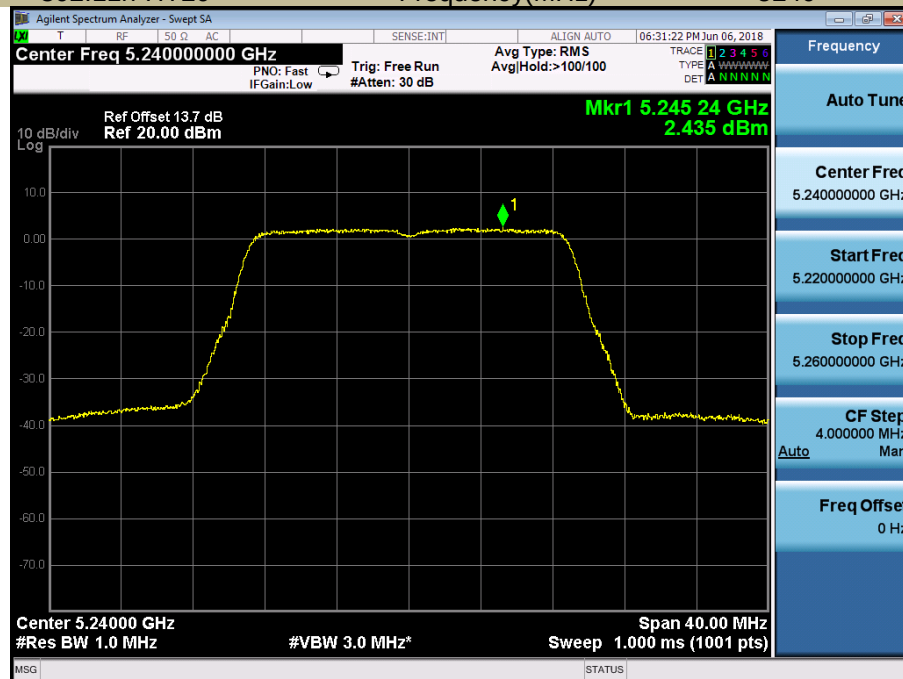
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5180



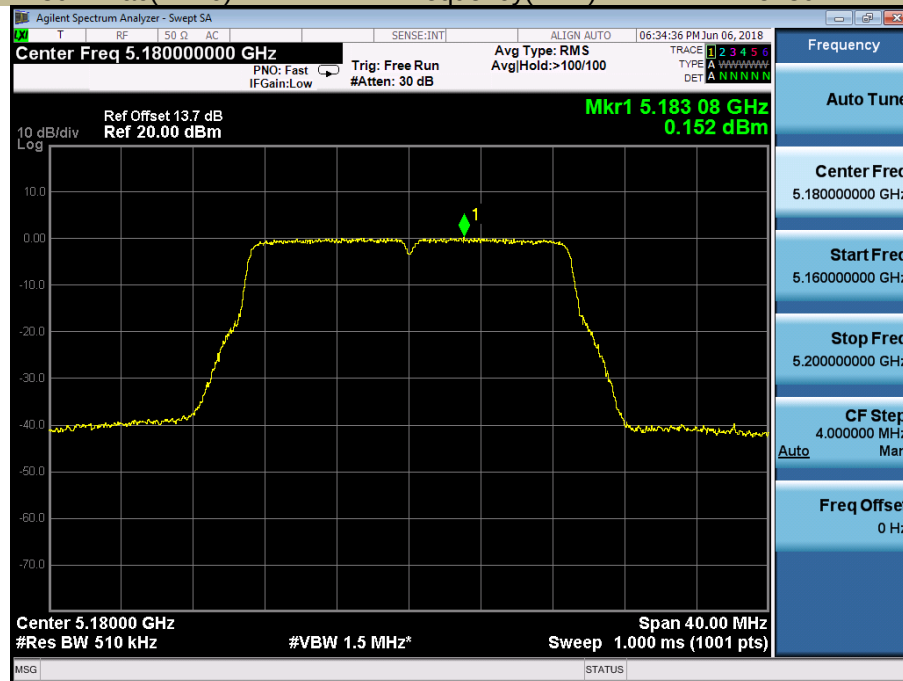
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5200



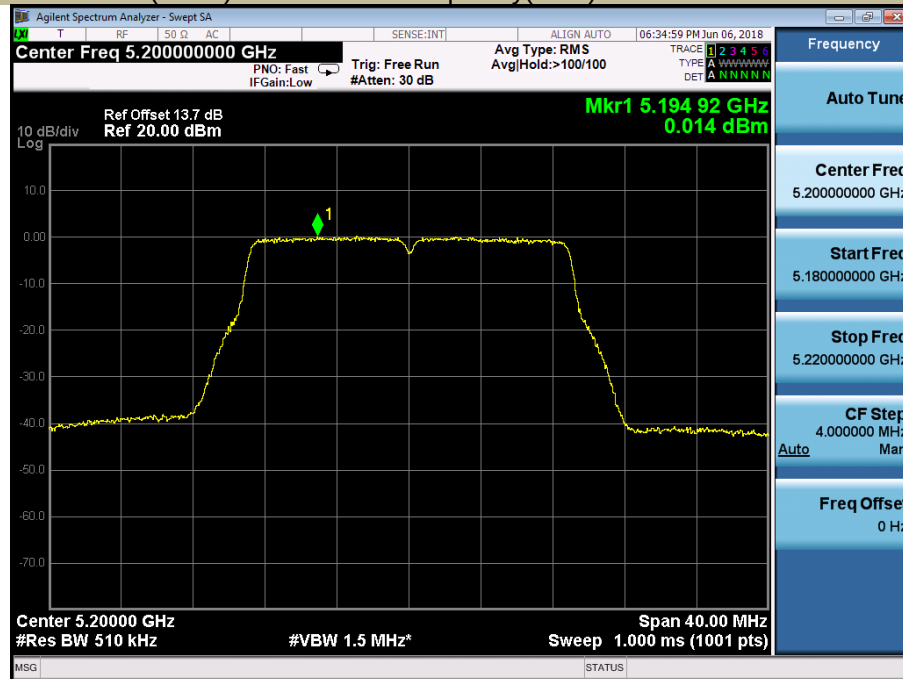
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5240



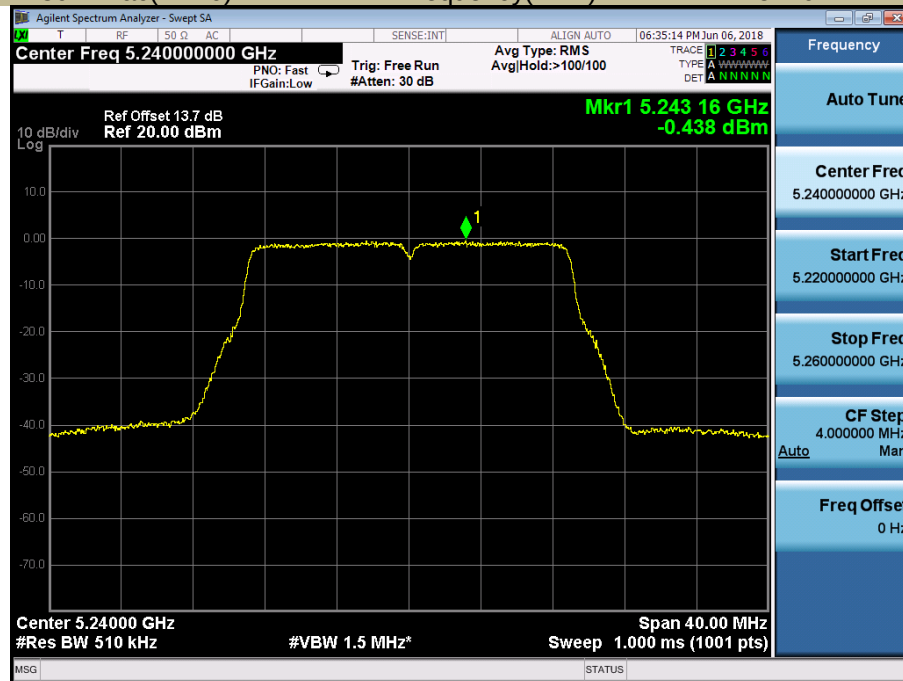
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5180



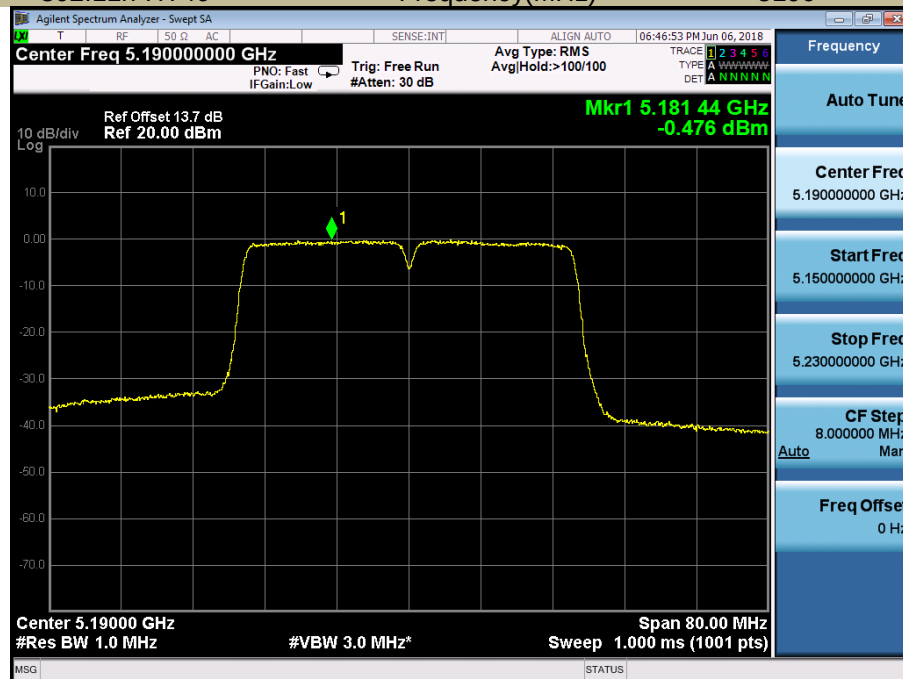
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5200



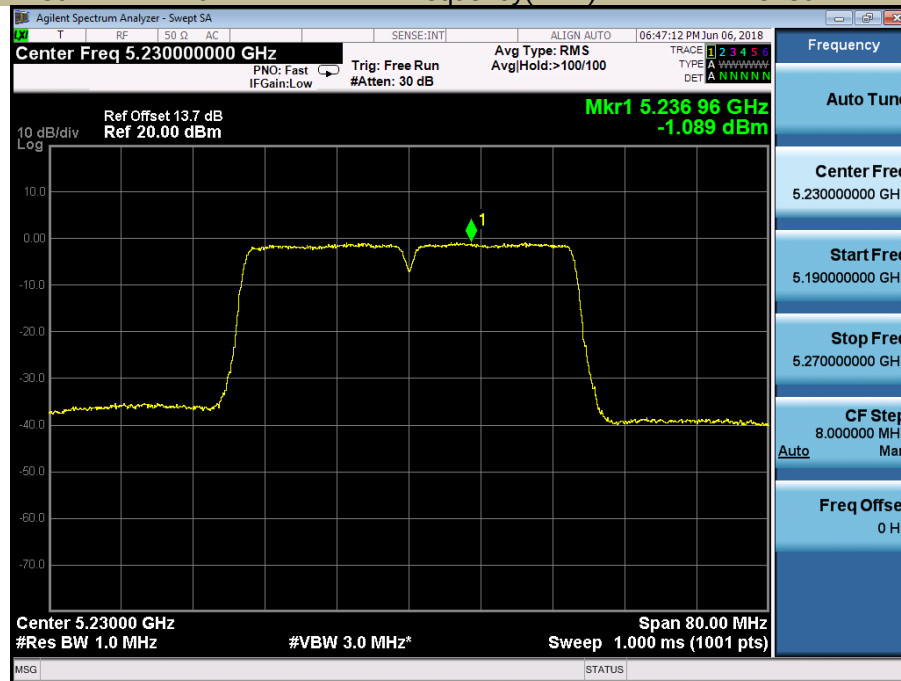
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Test Model 802.11ac(HT20) Frequency(MHz) 5240



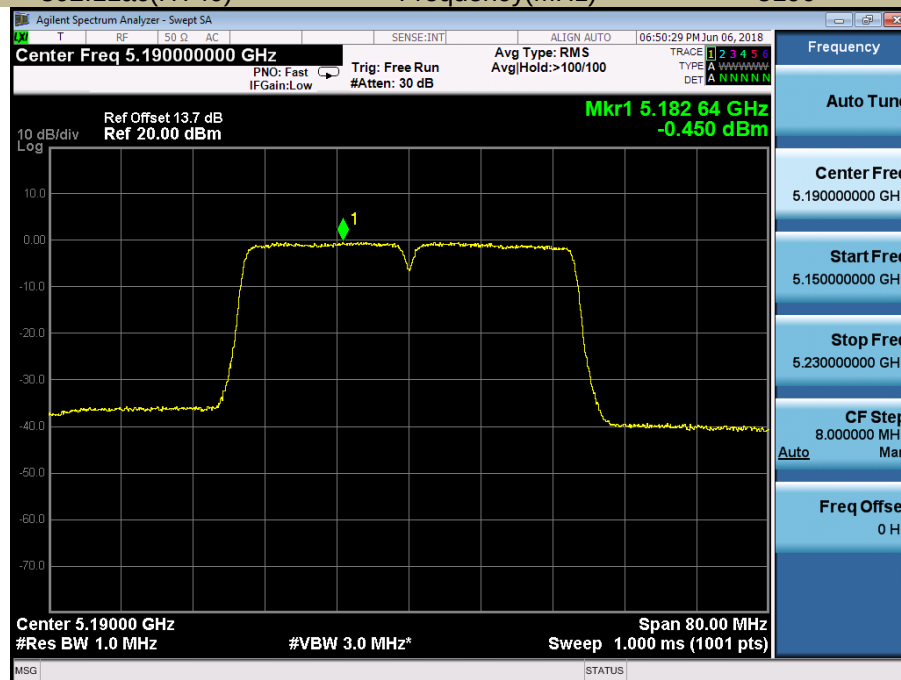
Power Spectral Density U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5190



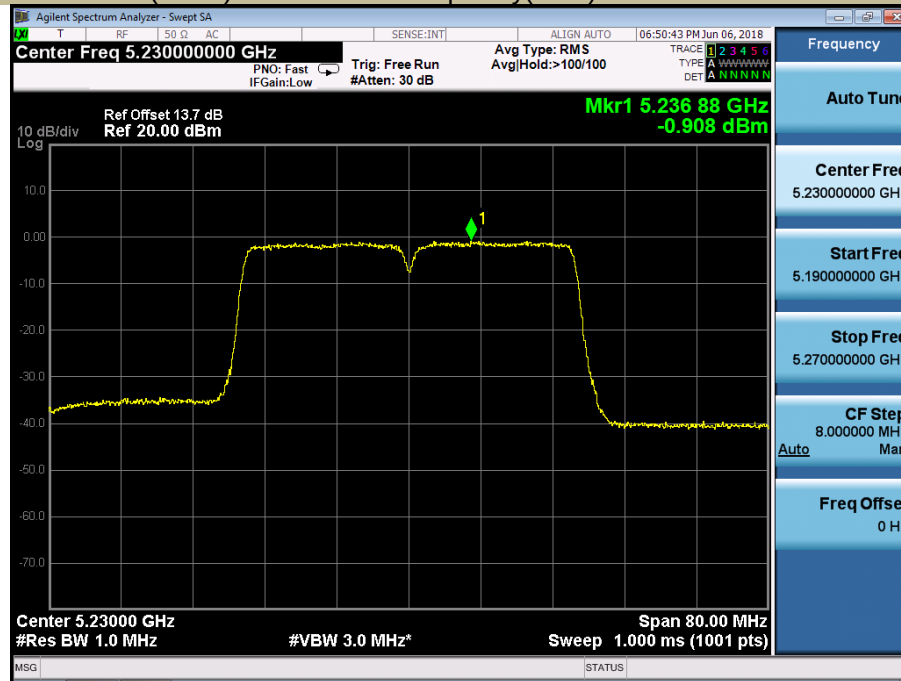
Power Spectral Density U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5230



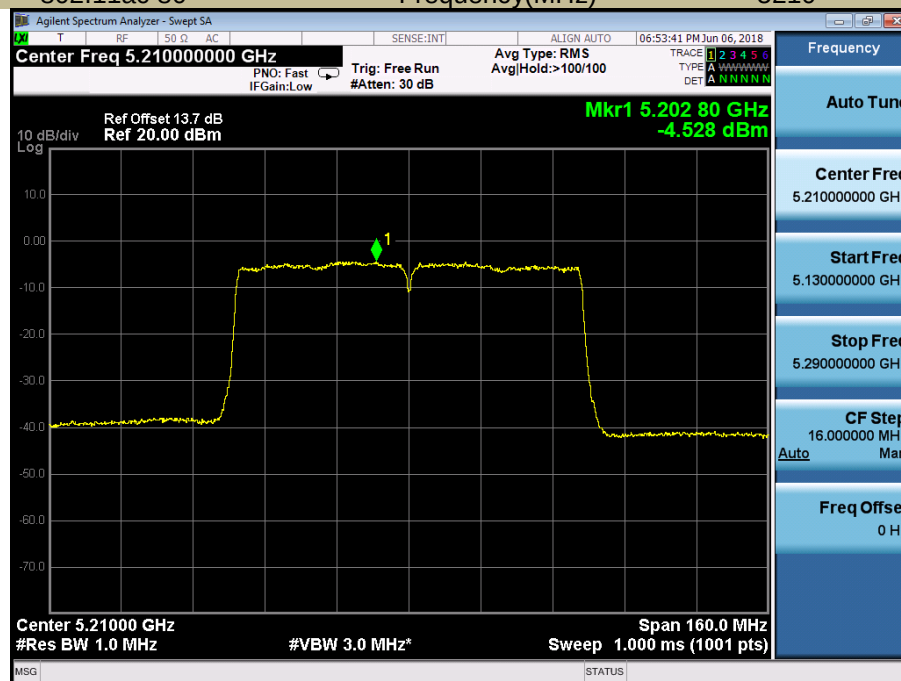
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT40) Frequency(MHz) 5190



Power Spectral Density
Test Model 802.11ac(HT40) U-NII - 1
Frequency(MHz) 5230



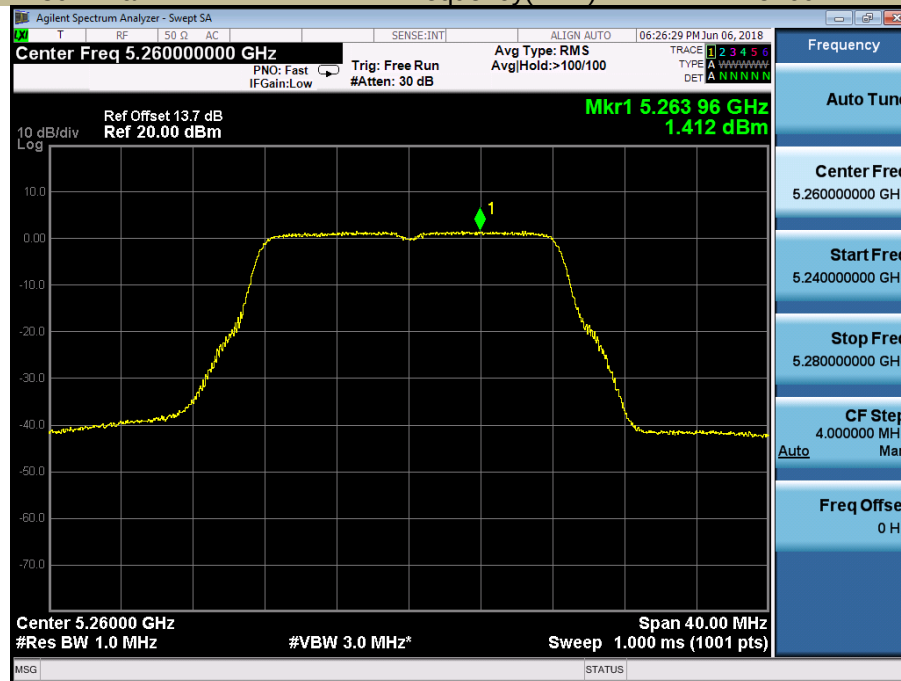
Power Spectral Density
Test Model 802.11ac 80 U-NII - 1
Frequency(MHz) 5210



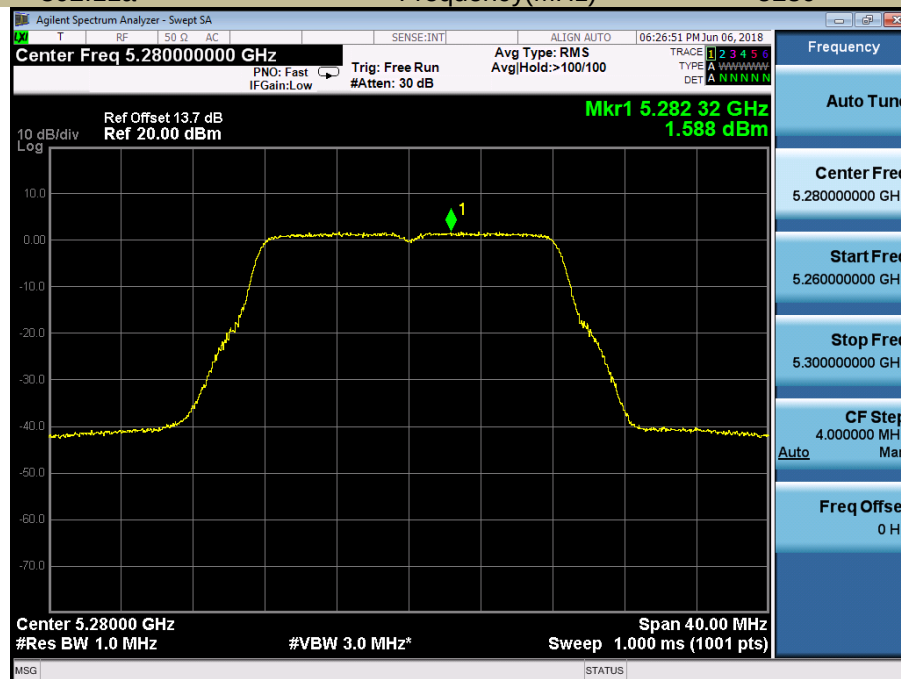
5250-5350MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5260	1.412	11
	5280	1.588	11
	5320	1.006	11
802.11n-HT20	5260	1.009	11
	5280	0.874	11
	5320	0.521	11
802.11ac(VHT20)	5260	0.931	11
	5280	1.092	11
	5320	0.516	11
802.11n-HT40	5270	-1.145	11
	5310	-1.732	11
802.11ac(VHT40)	5270	-1.298	11
	5310	-1.371	11
802.11ac(VHT80)	5290	-5.328	11

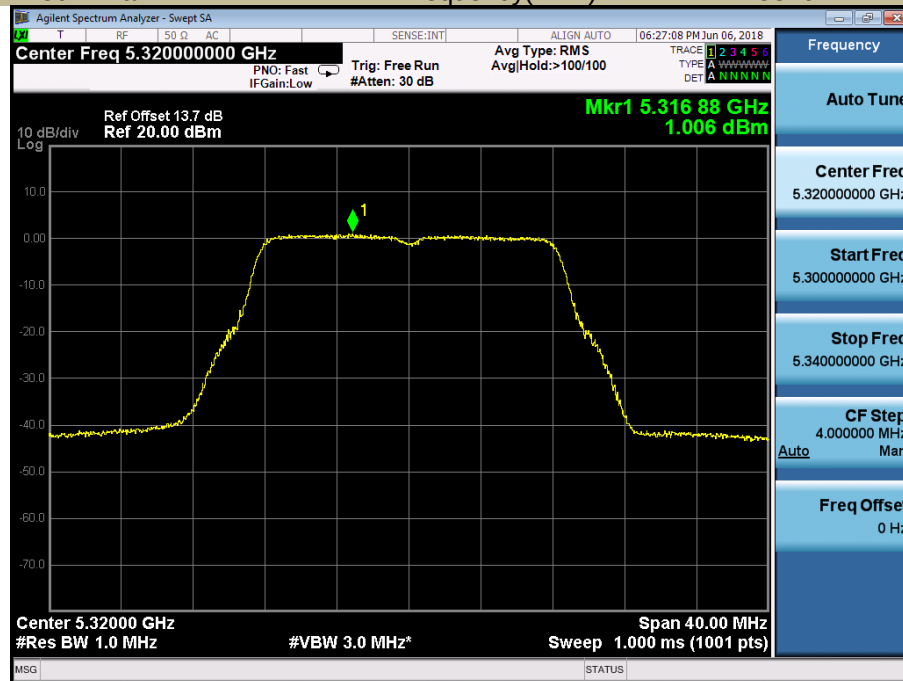
Power Spectral Density
Test Model 802.11a
U-NII – 2A
Frequency(MHz) 5260



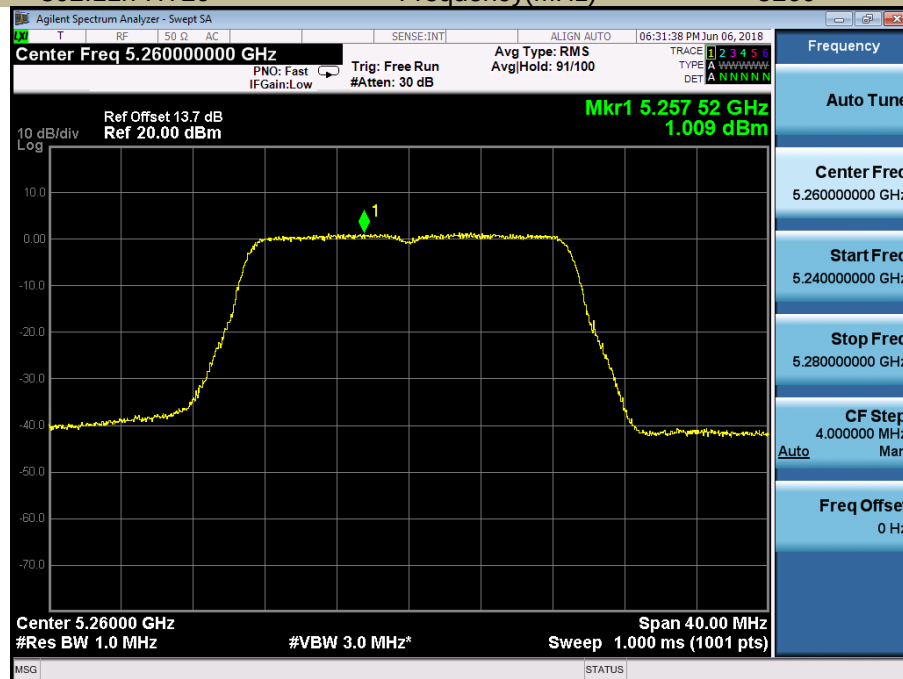
Power Spectral Density
Test Model 802.11a
U-NII – 2A
Frequency(MHz) 5280



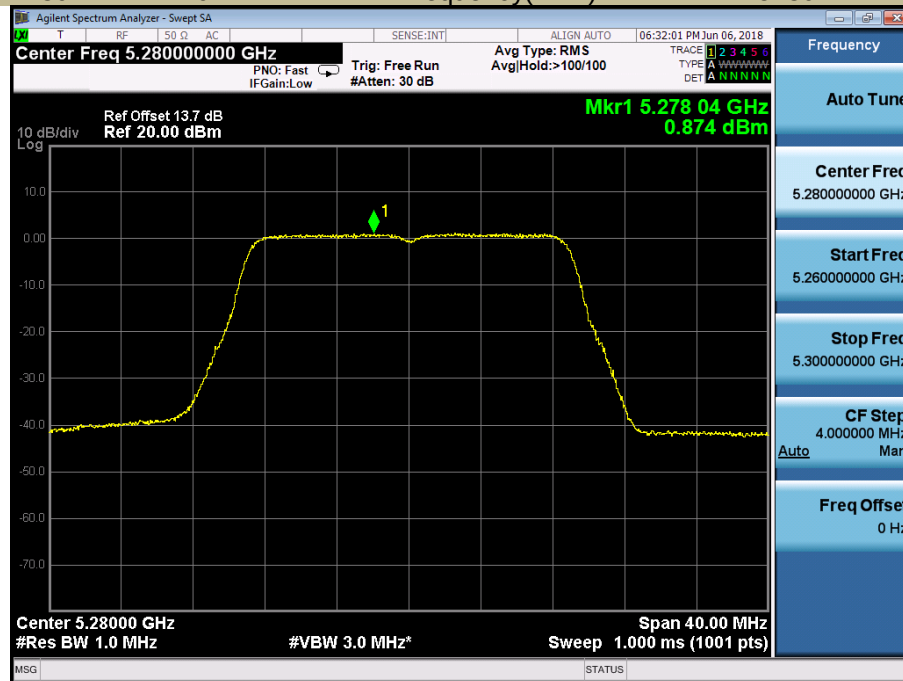
Power Spectral Density U-NII – 2A
Test Model 802.11a Frequency(MHz) 5320



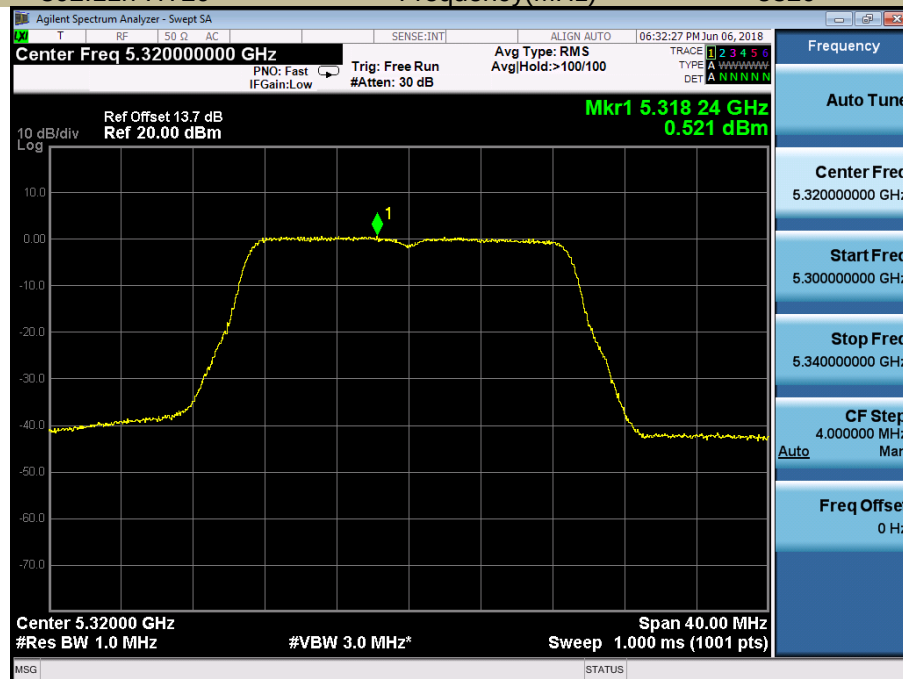
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5260



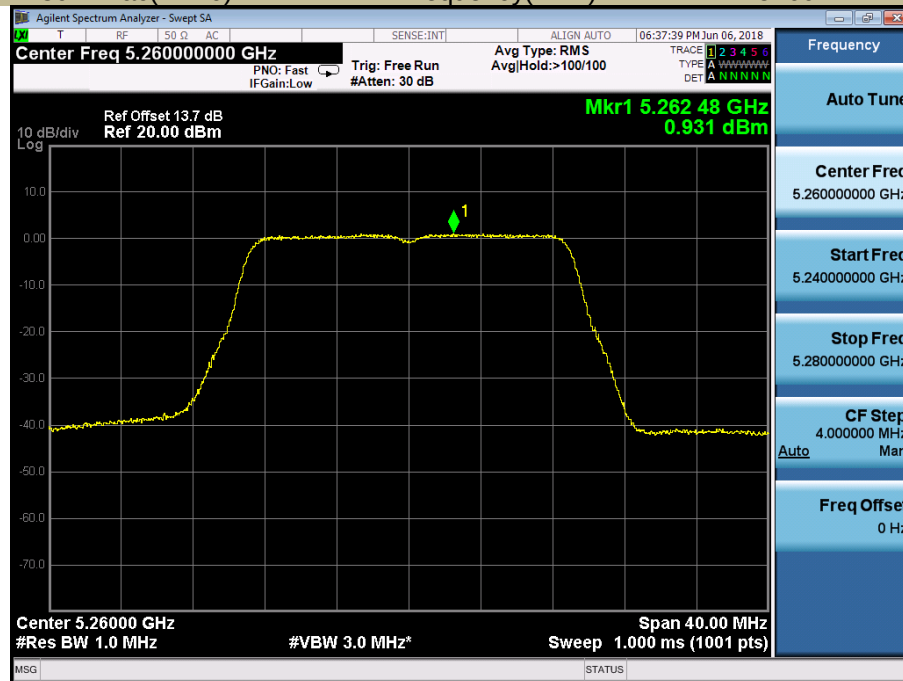
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5280



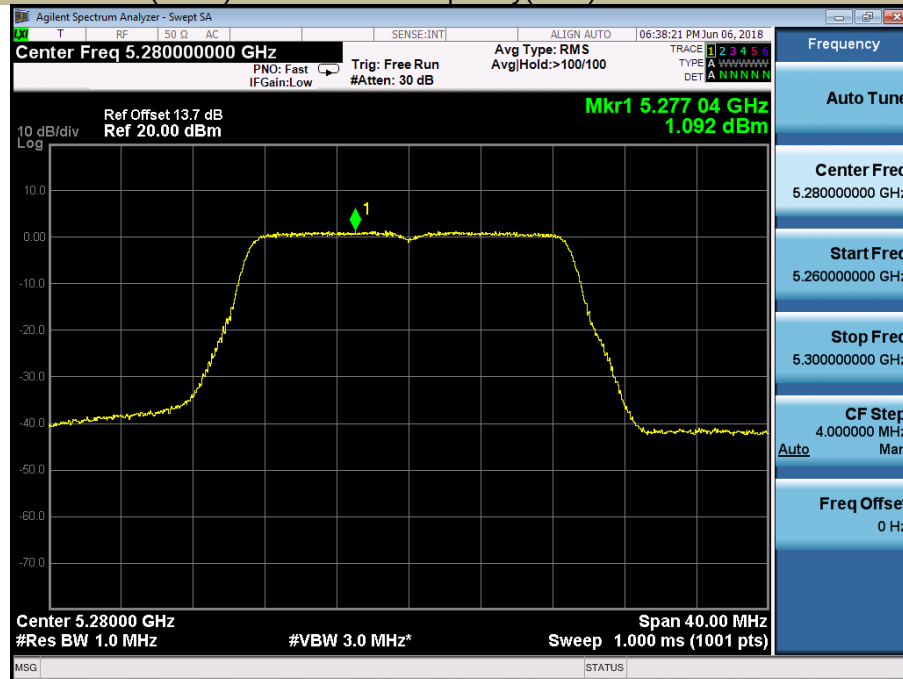
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5320



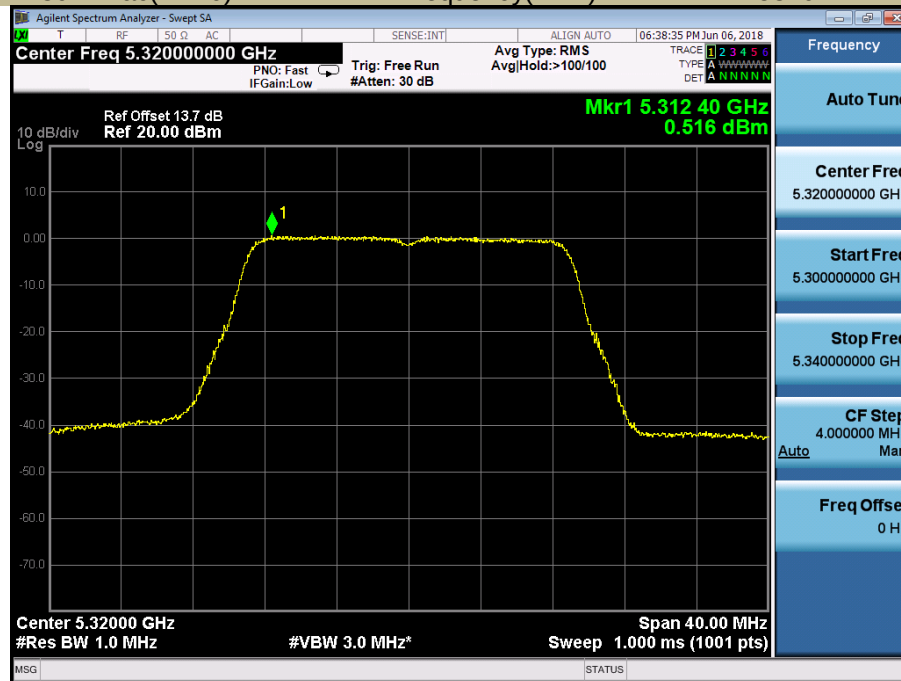
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5260



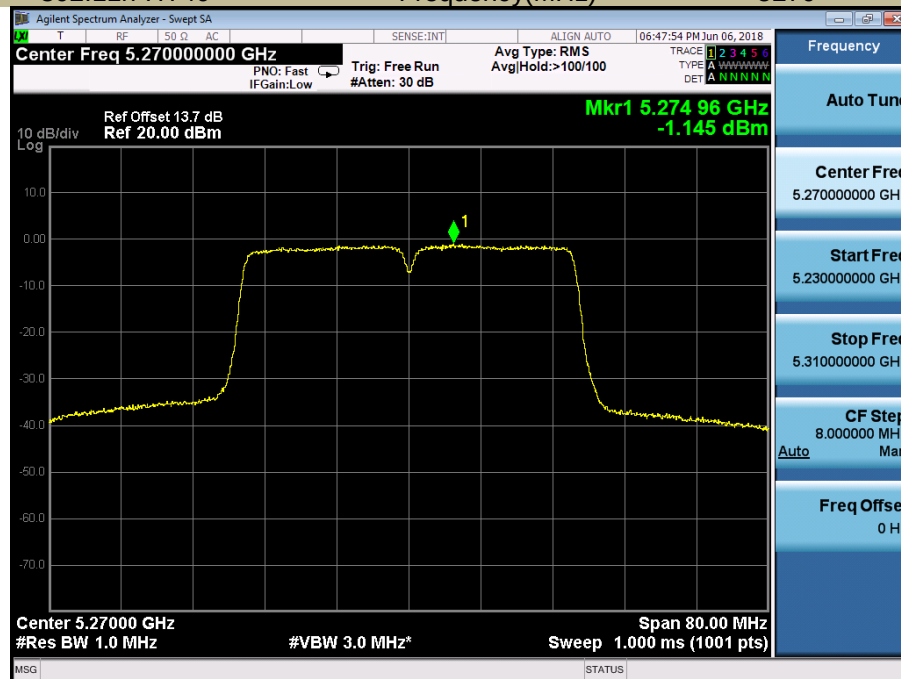
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5280



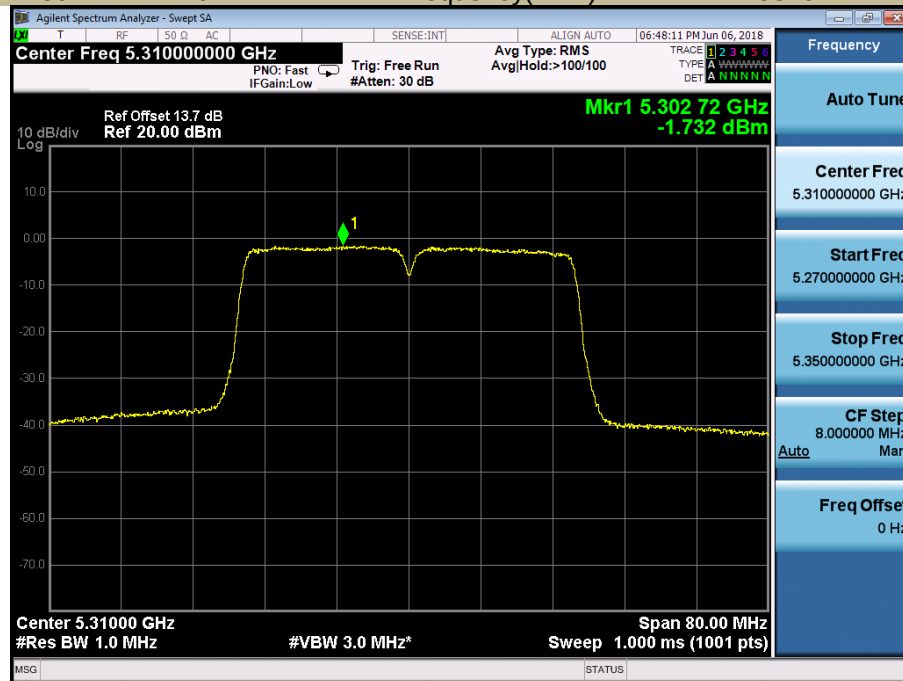
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5320



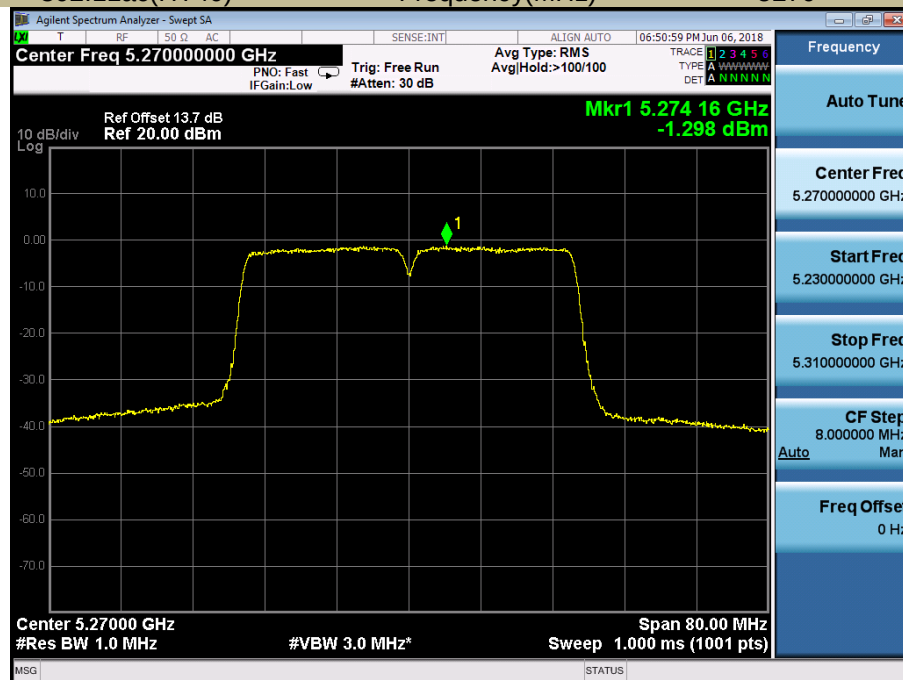
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5270



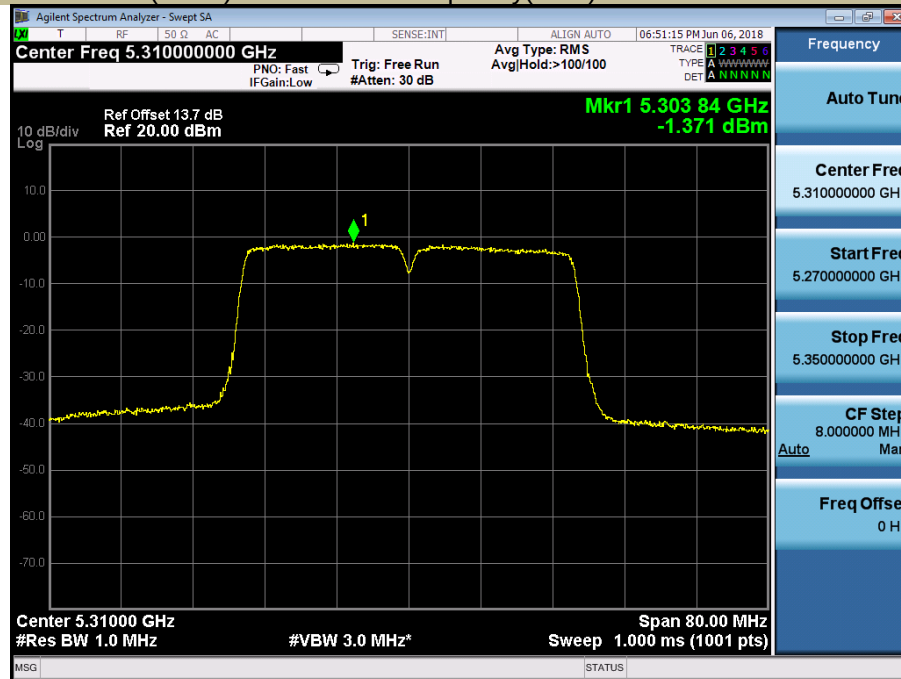
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5310



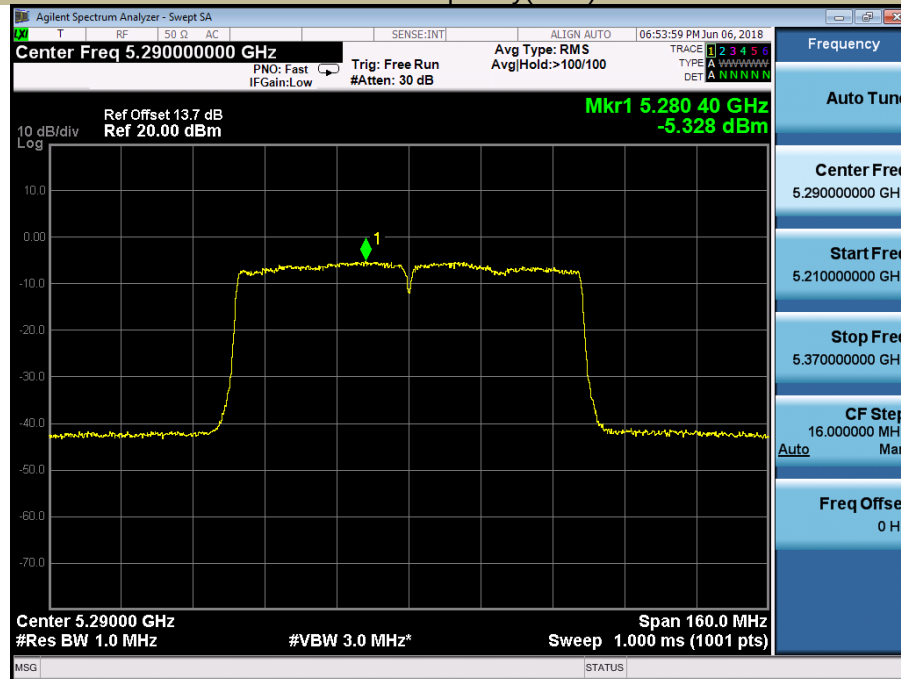
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5270



Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5310



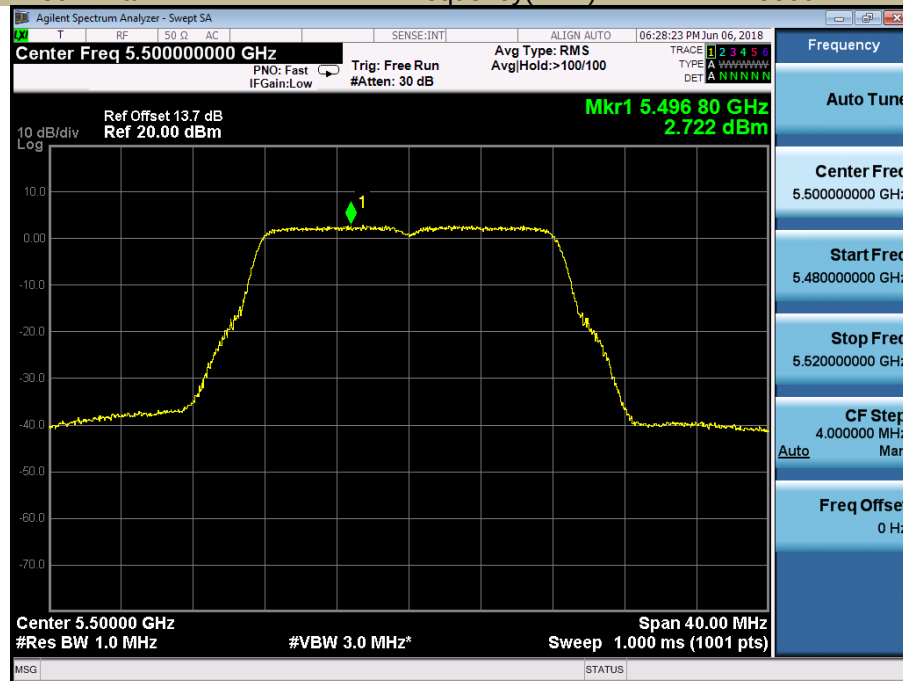
Power Spectral Density U-NII – 2A
Test Model 802.11ac 80 Frequency(MHz) 5290



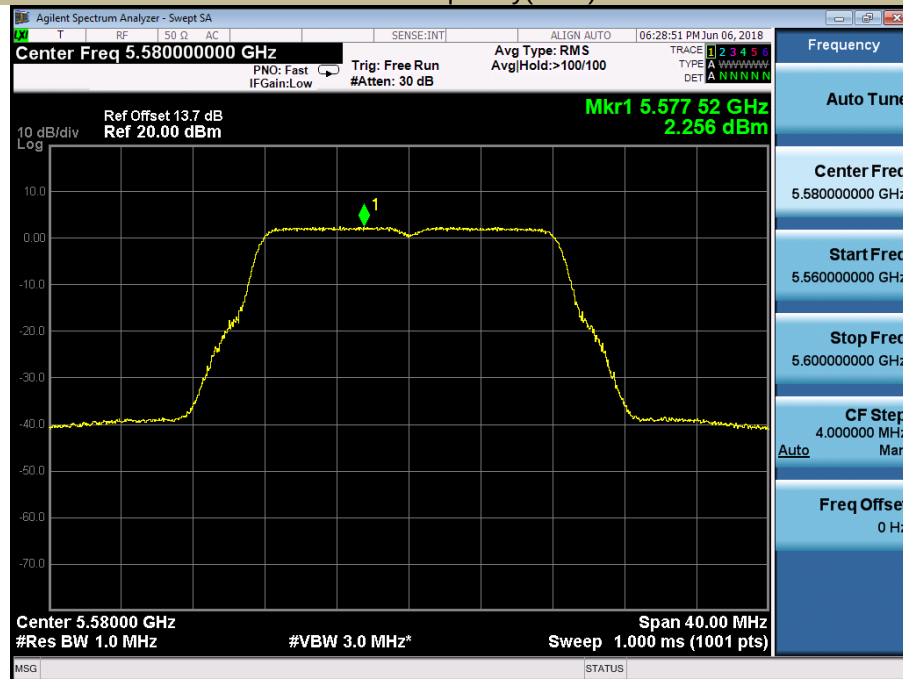
5470-5725MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5500	2.722	11
	5580	2.256	11
	5700	0.968	11
802.11n-HT20	5500	2.574	11
	5580	2.247	11
	5700	0.526	11
802.11ac(VHT20)	5500	2.128	11
	5580	2.148	11
	5700	0.406	11
802.11n-HT40	5510	-0.282	11
	5550	-0.274	11
	5670	-2.359	11
802.11ac(VHT40)	5510	-0.506	11
	5550	-0.540	11
	5670	-2.646	11
802.11ac(VHT80)	5530	-4.506	11

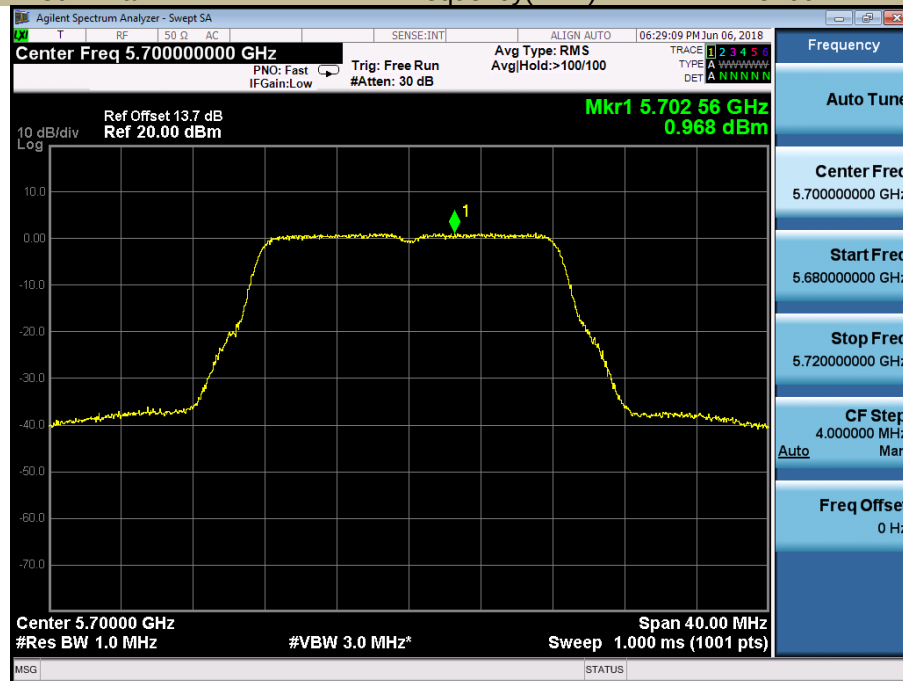
Power Spectral Density U-NII – 2C
Test Model 802.11a Frequency(MHz) 5500



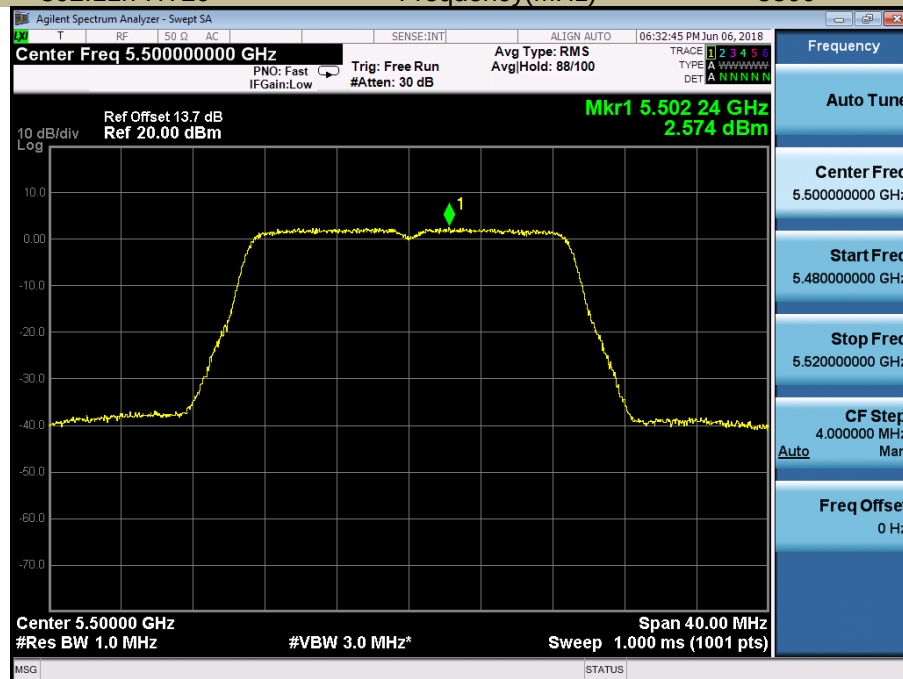
Power Spectral Density U-NII – 2C
Test Model 802.11a Frequency(MHz) 5580



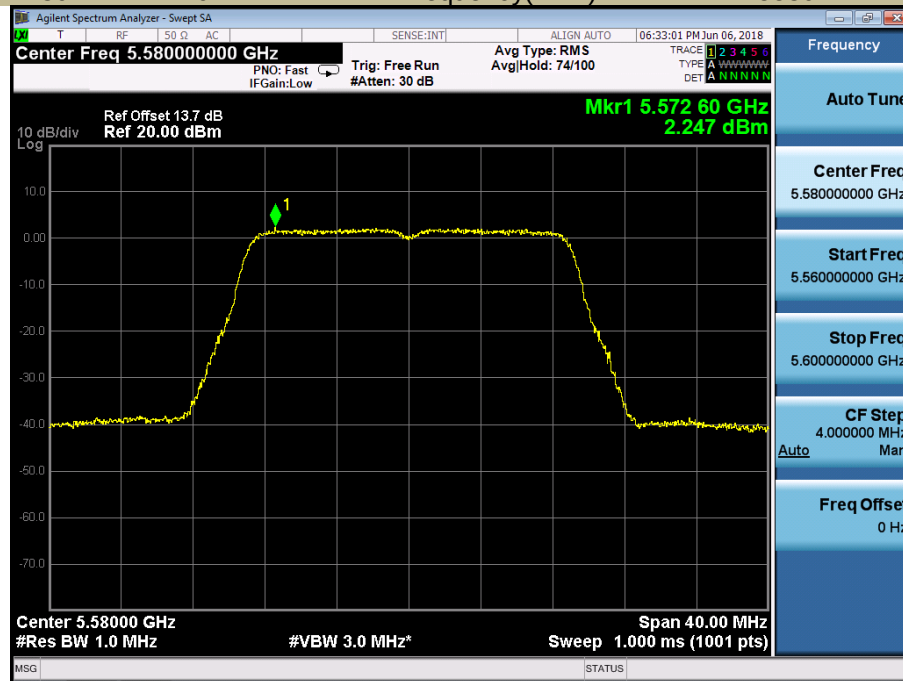
Power Spectral Density U-NII – 2C
Test Model 802.11a Frequency(MHz) 5700



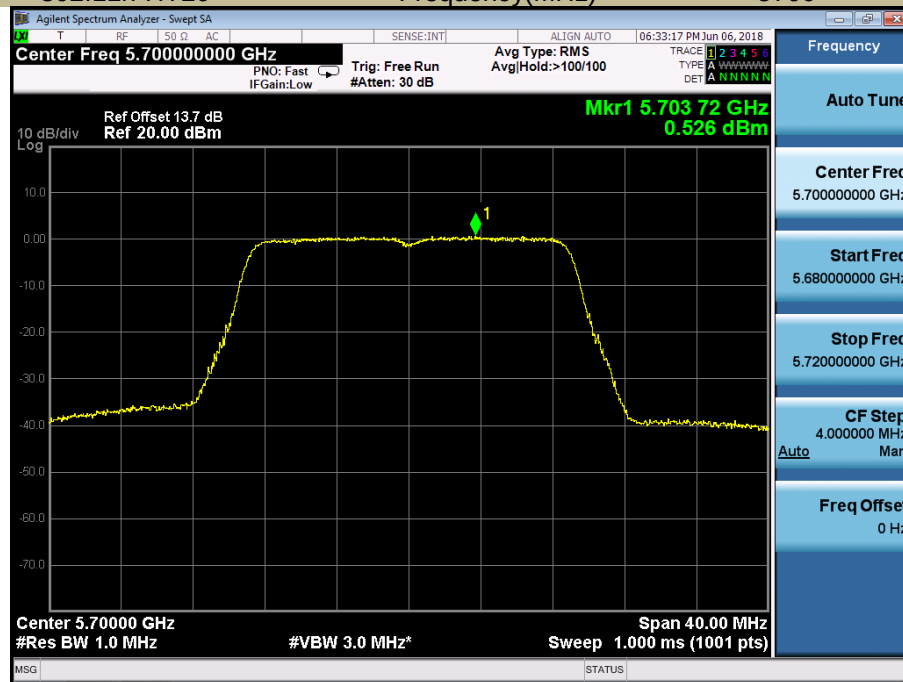
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5500



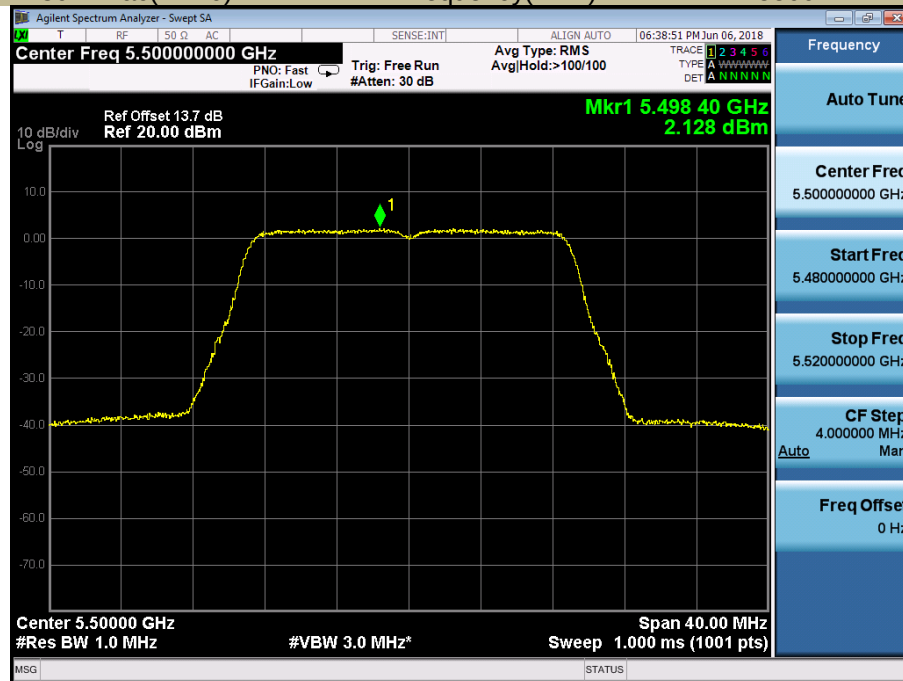
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5580



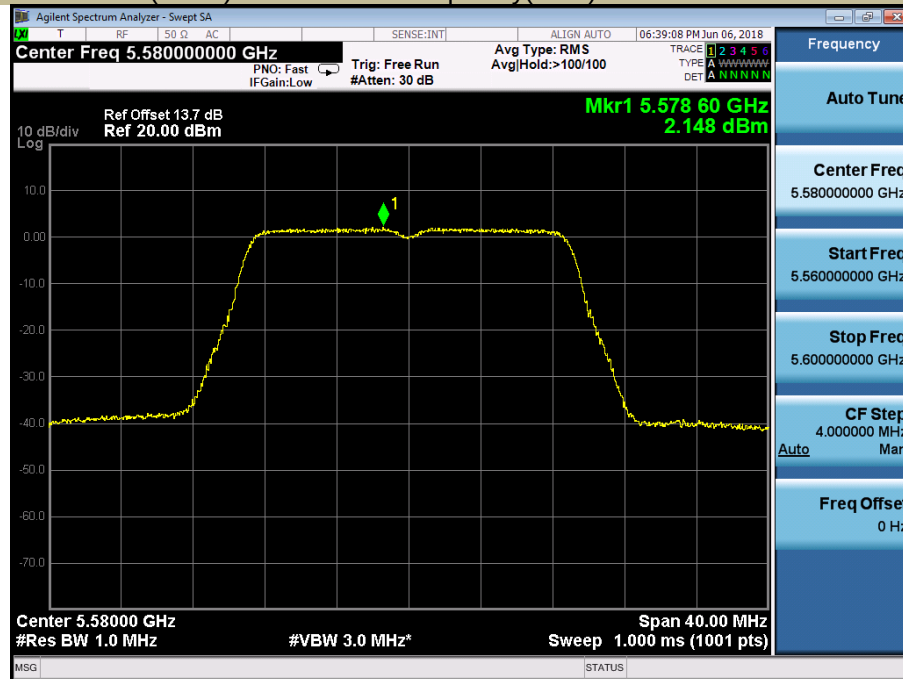
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5700



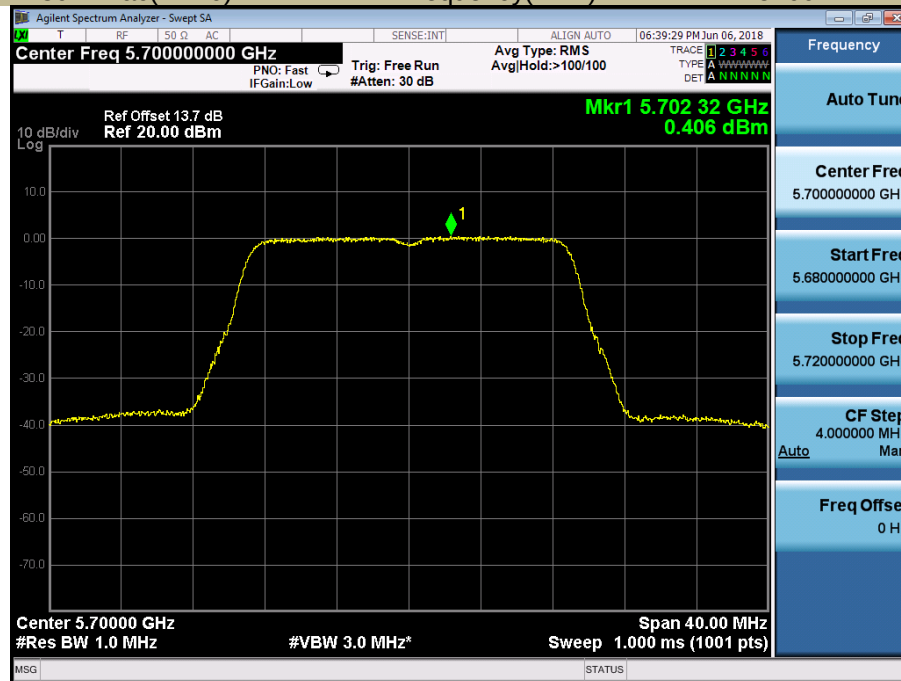
Power Spectral Density U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5500



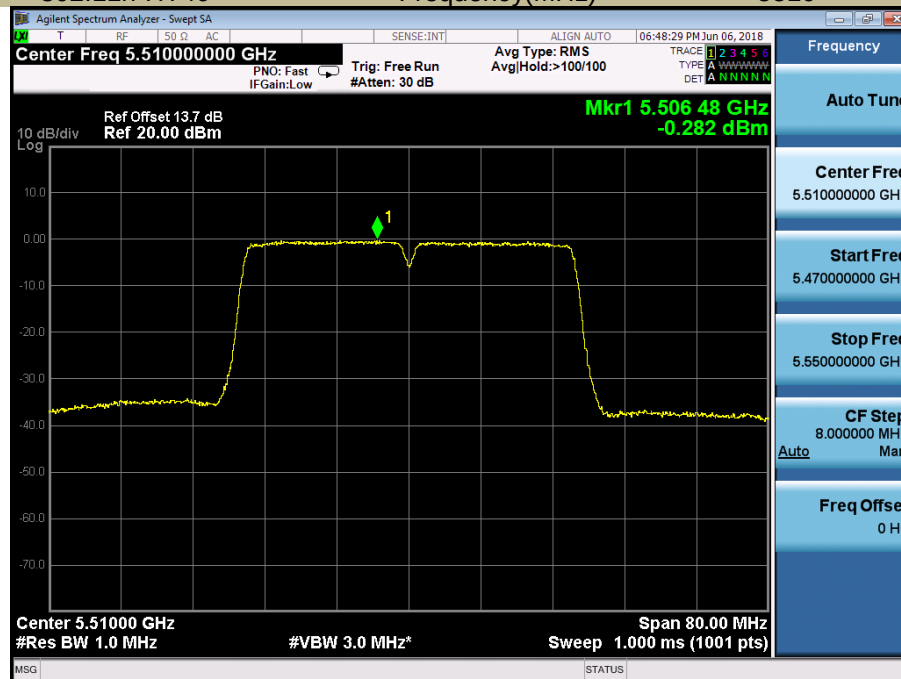
Power Spectral Density U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5580



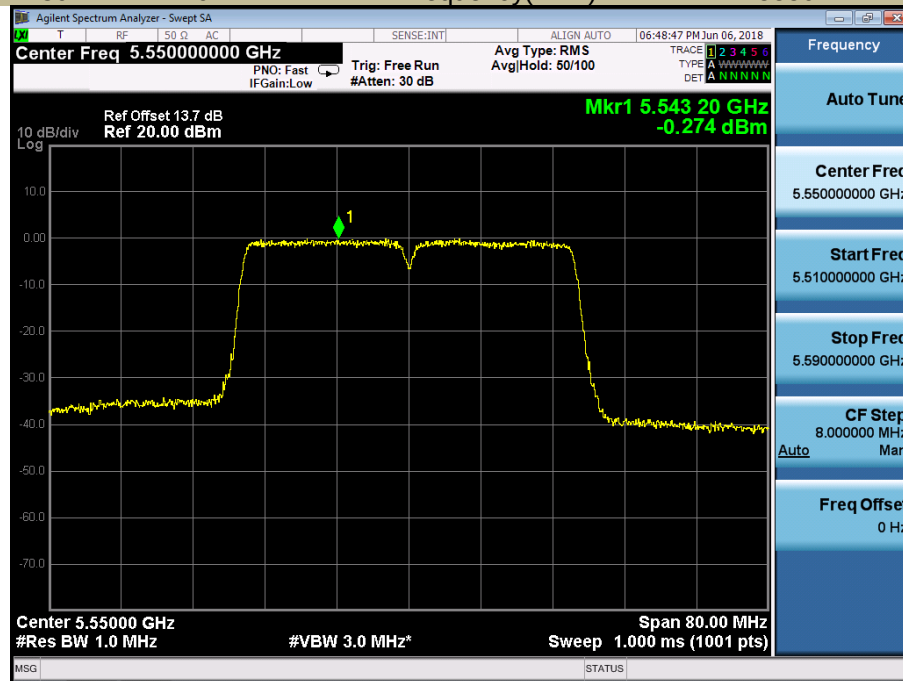
Power Spectral Density U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5700



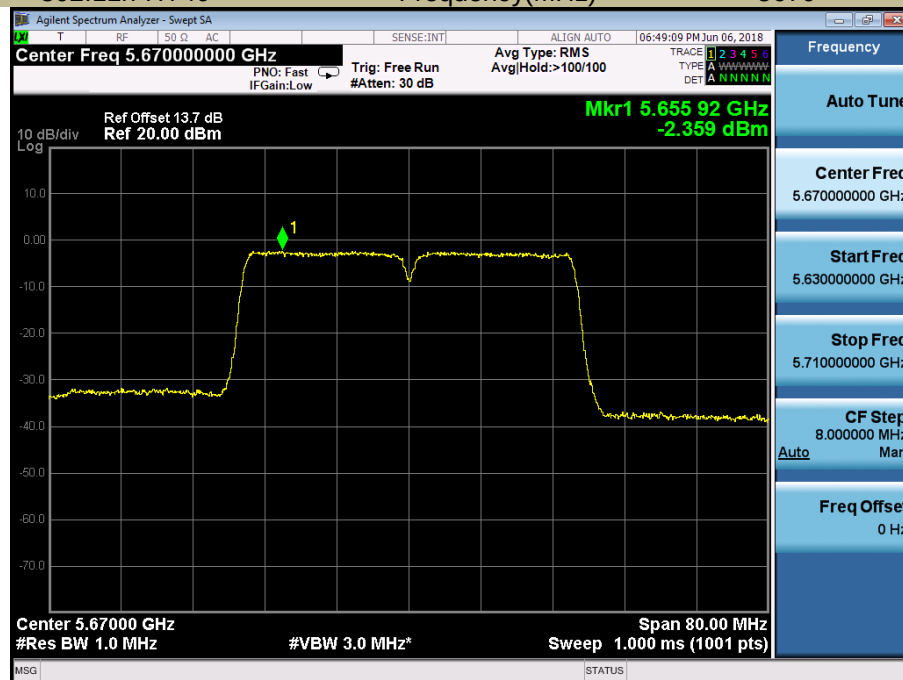
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT40 Frequency(MHz) 5510



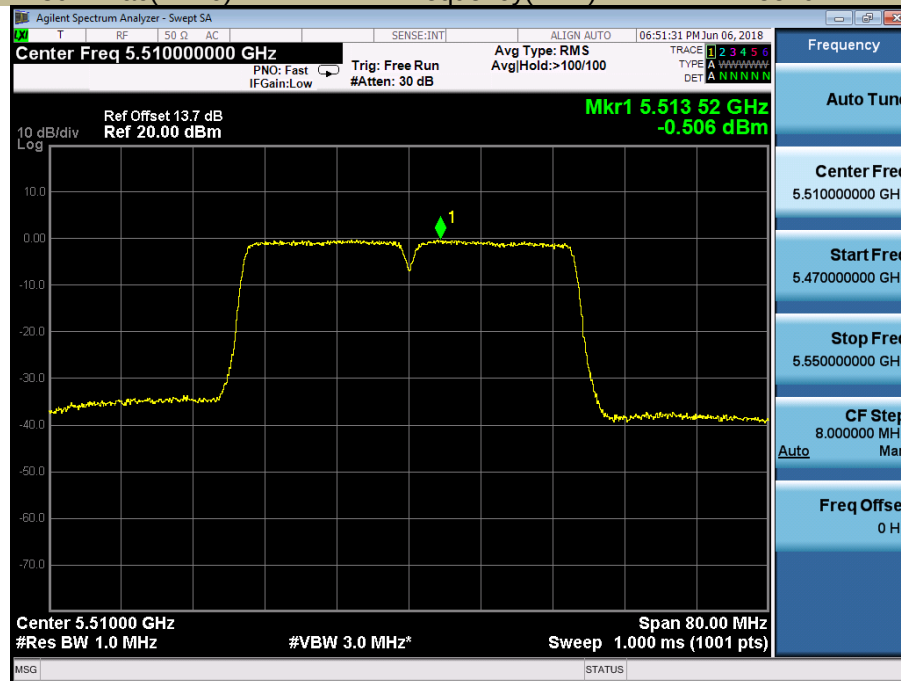
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT40 Frequency(MHz) 5550



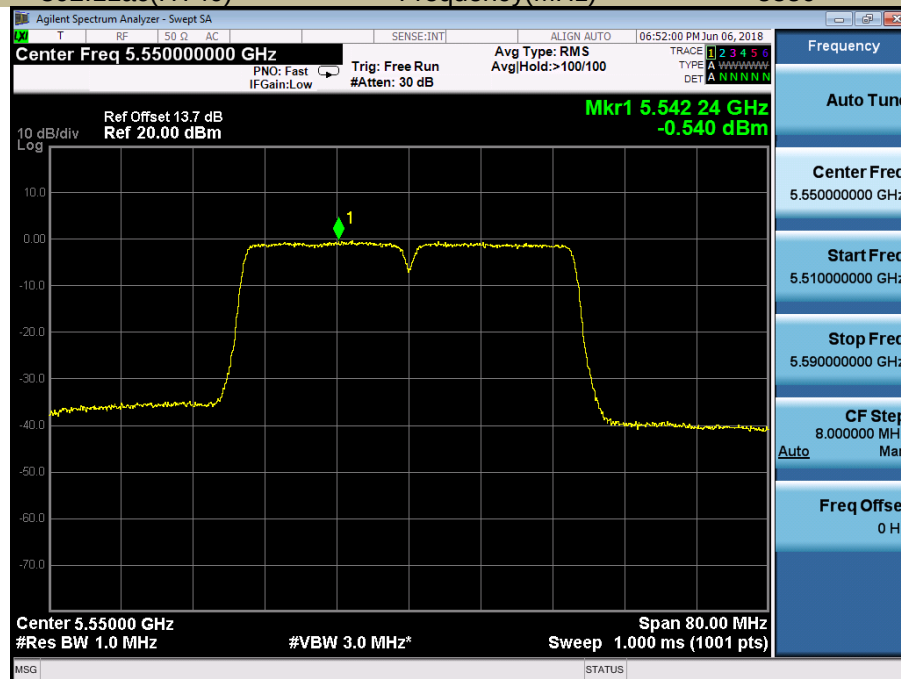
Power Spectral Density U-NII – 2C
Test Model 802.11n-HT40 Frequency(MHz) 5670



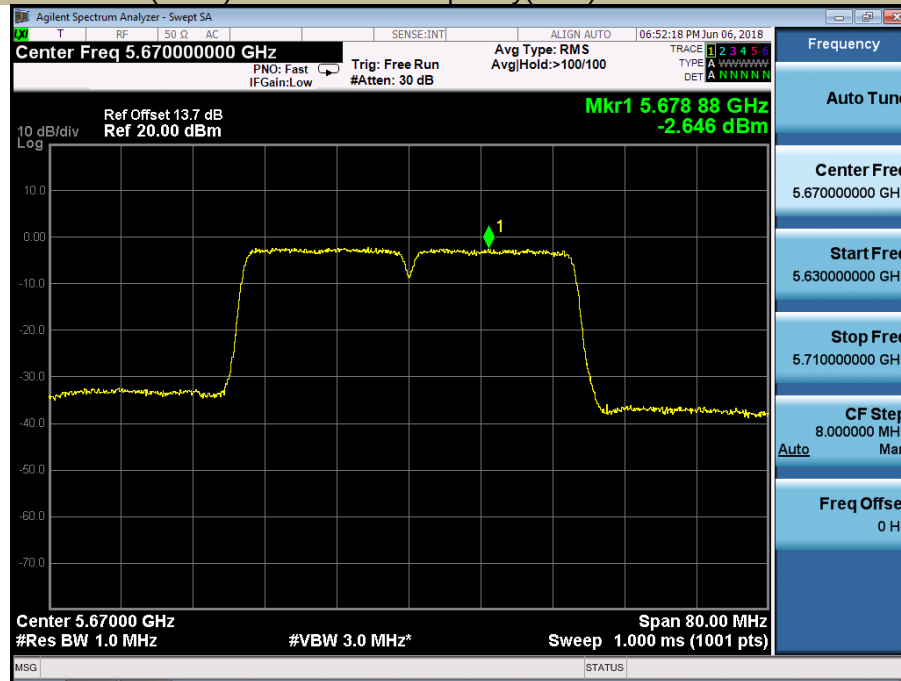
Power Spectral Density U-NII – 2C
Test Model 802.11ac(HT40) Frequency(MHz) 5510



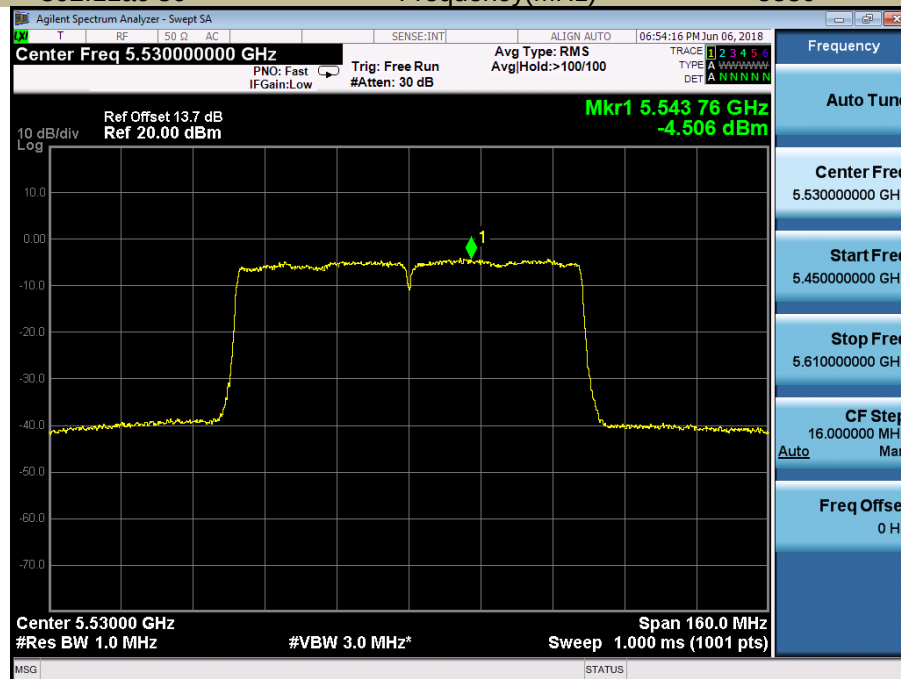
Power Spectral Density U-NII – 2C
Test Model 802.11ac(HT40) Frequency(MHz) 5550



Power Spectral Density
Test Model 802.11ac(HT40) U-NII – 2C
Frequency(MHz) 5670



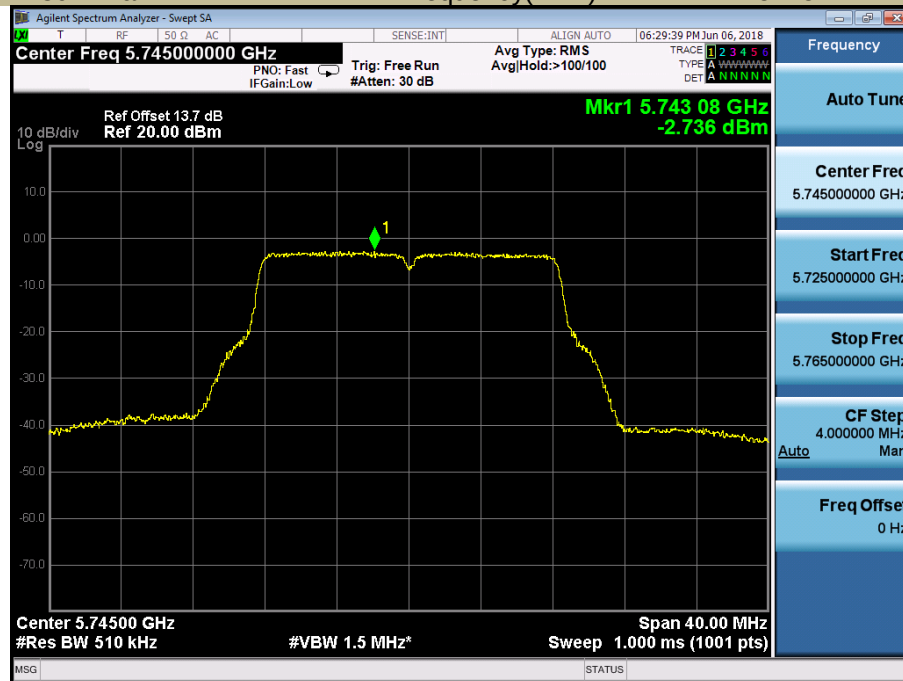
Power Spectral Density
Test Model 802.11ac 80 U-NII – 2C
Frequency(MHz) 5530



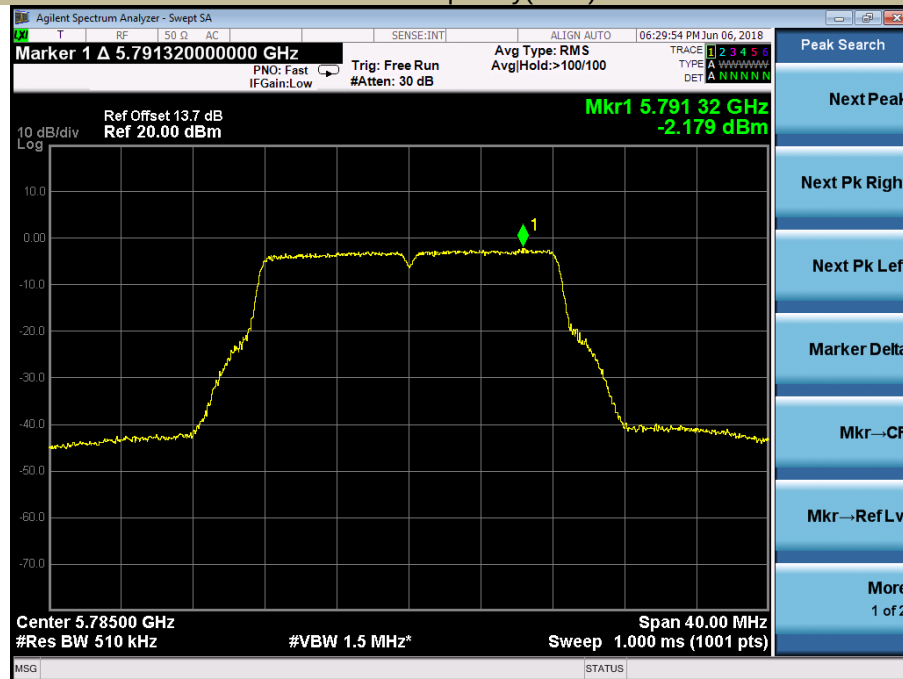
5725-5850MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5745	-2.736	30
	5785	-2.179	30
	5825	-2.389	30
802.11n-HT20	5745	-3.440	30
	5785	-2.781	30
	5825	-2.738	30
802.11ac(VHT20)	5745	-3.544	30
	5785	-3.091	30
	5825	-3.053	30
802.11n-HT40	5755	-6.241	30
	5795	-5.152	30
802.11ac(VHT40)	5755	-6.224	30
	5795	-4.964	30
802.11ac(VHT80)	5775	-8.652	30

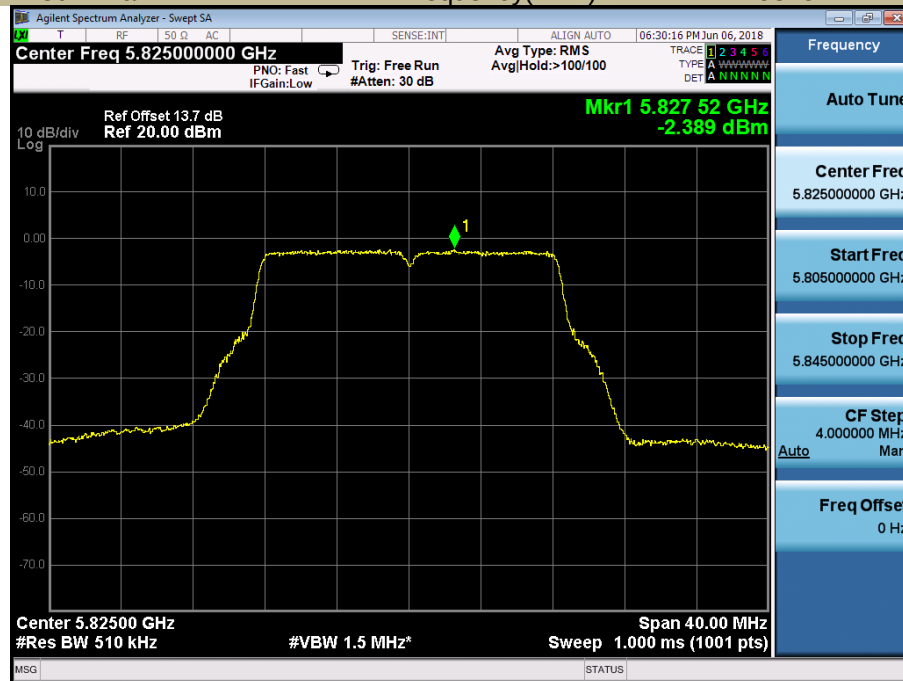
Power Spectral Density U-NII - 3
Test Model 802.11a Frequency(MHz) 5745



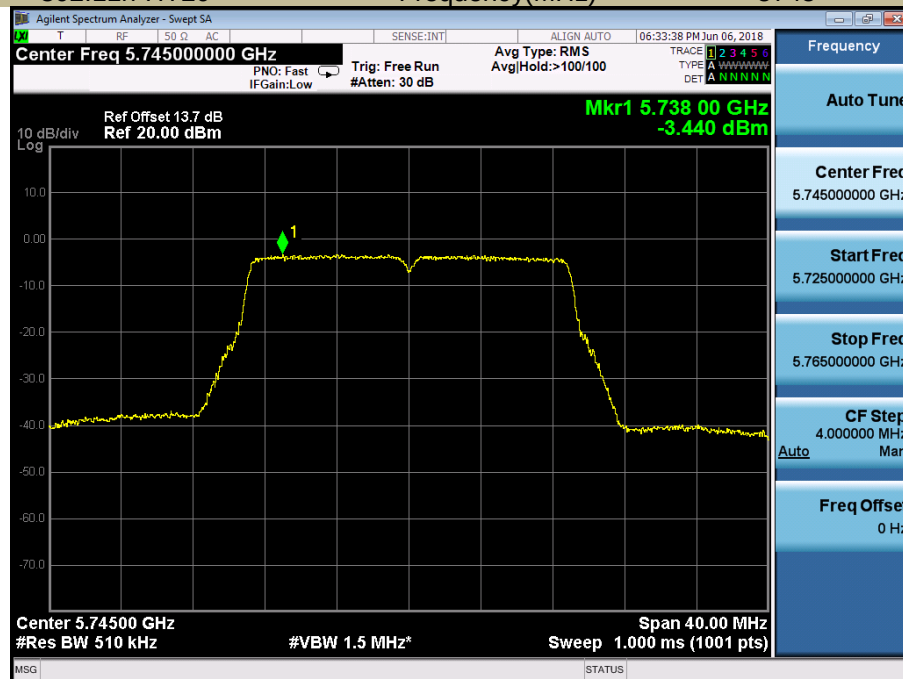
Power Spectral Density U-NII - 3
Test Model 802.11a Frequency(MHz) 5785



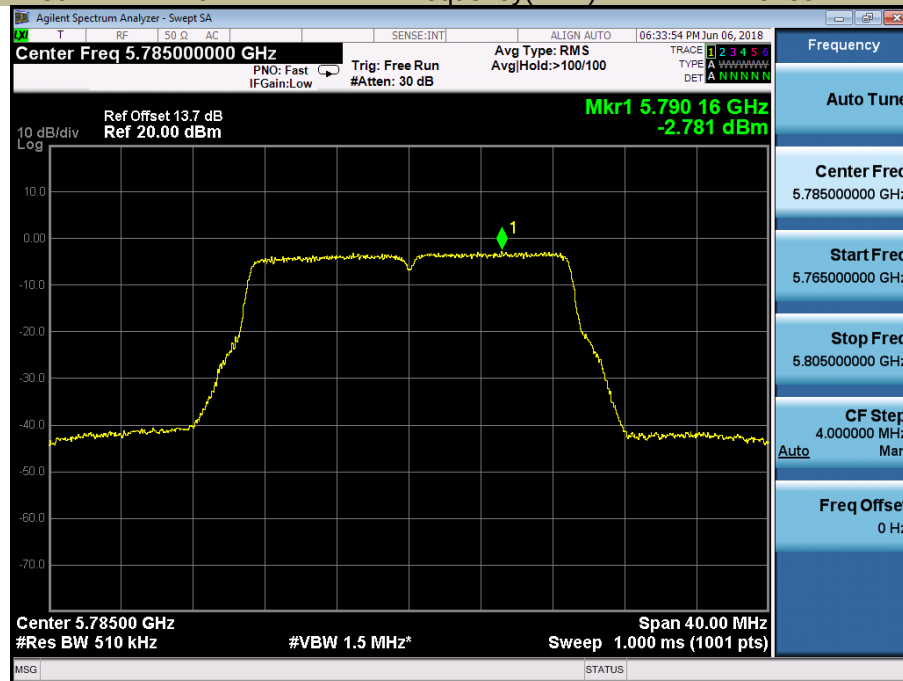
Power Spectral Density U-NII - 3
Test Model 802.11a Frequency(MHz) 5825



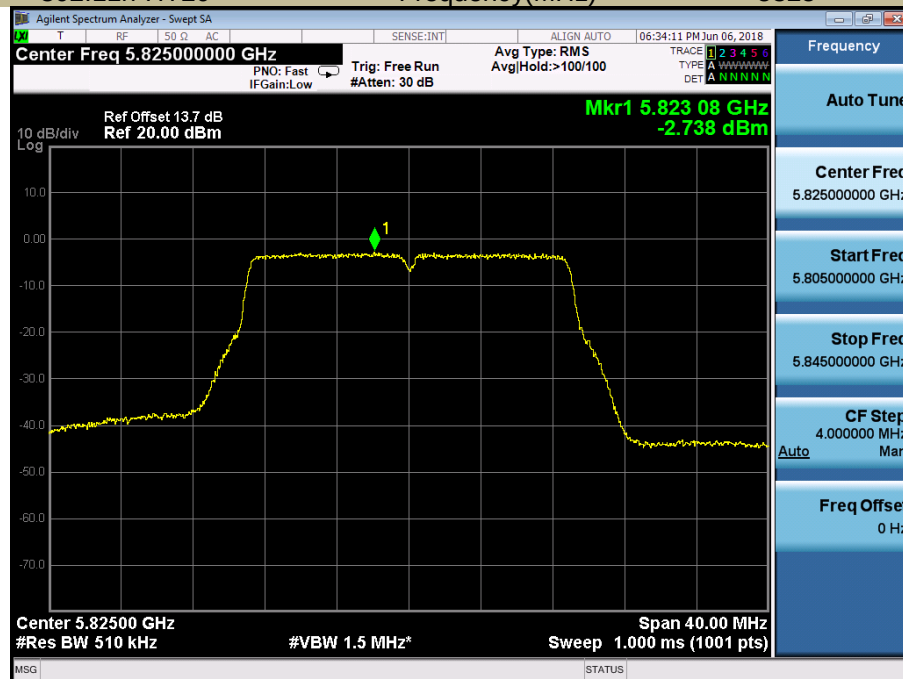
Power Spectral Density U-NII - 3
Test Model 802.11n-HT20 Frequency(MHz) 5745



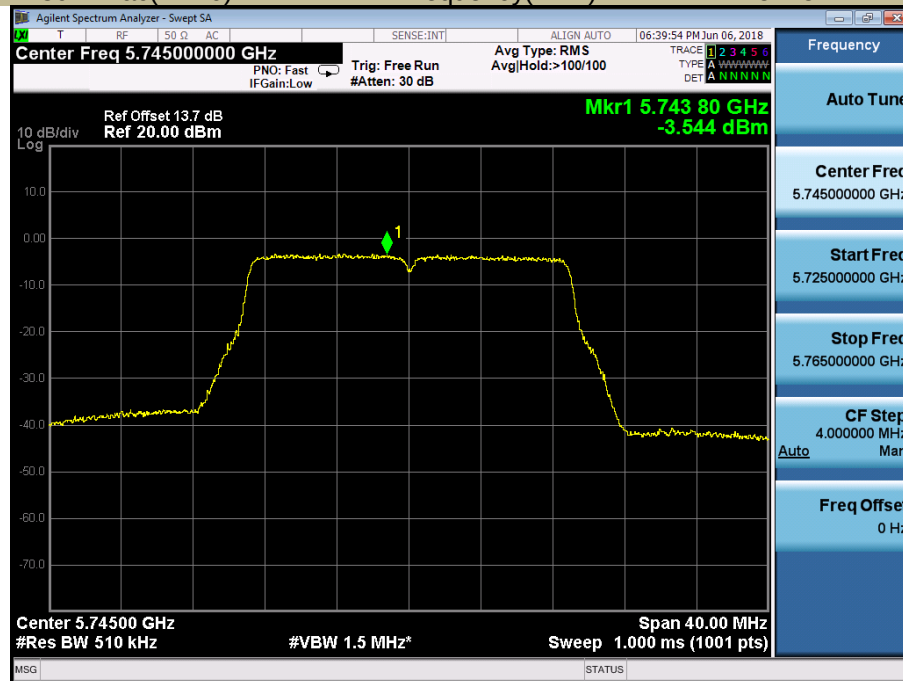
Power Spectral Density U-NII - 3
Test Model 802.11n-HT20 Frequency(MHz) 5785



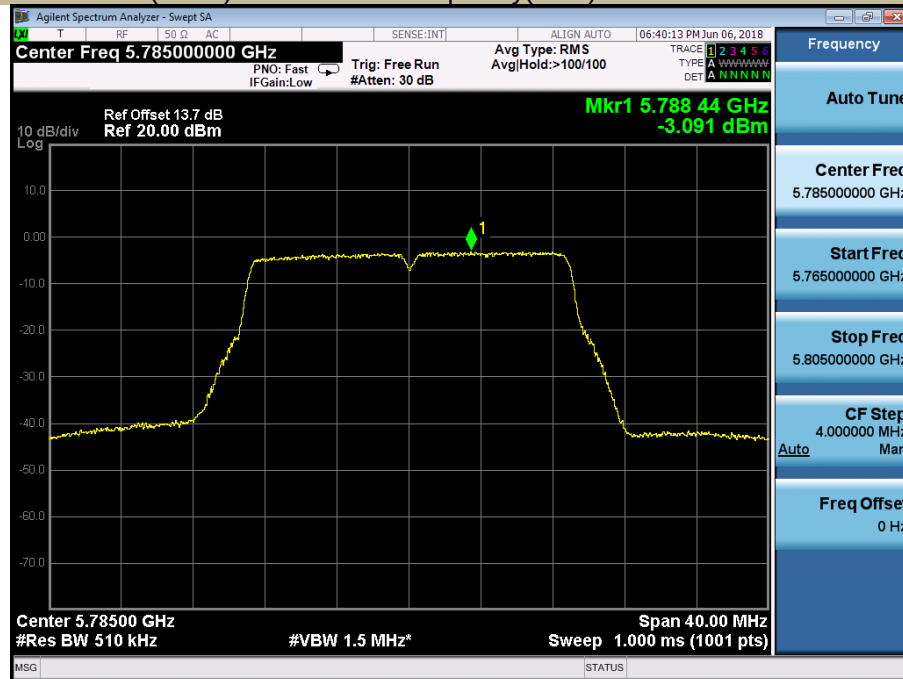
Power Spectral Density U-NII - 3
Test Model 802.11n-HT20 Frequency(MHz) 5825



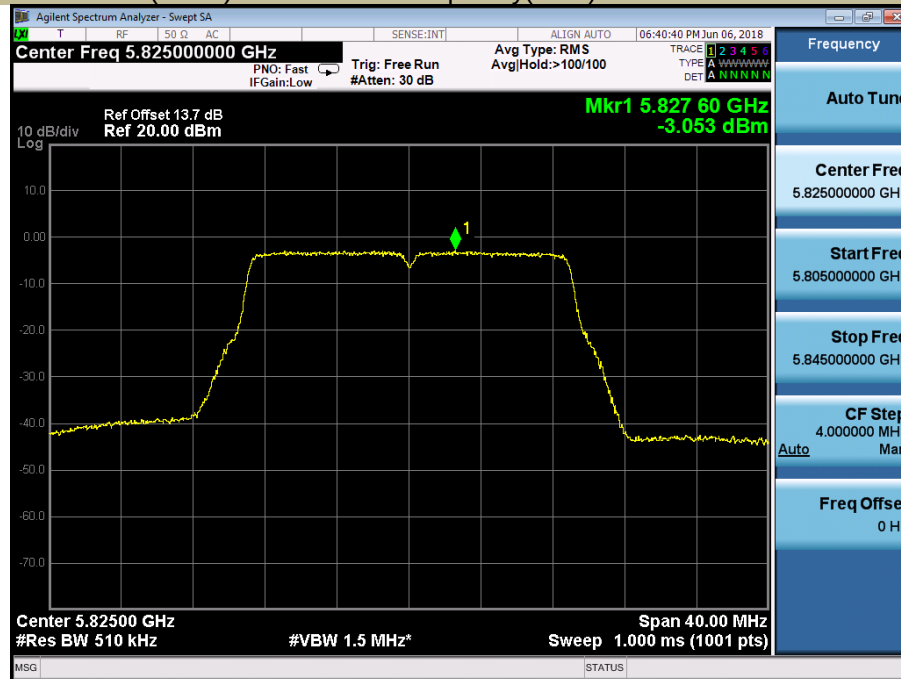
Power Spectral Density U-NII - 3
Test Model 802.11ac(HT20) Frequency(MHz) 5745



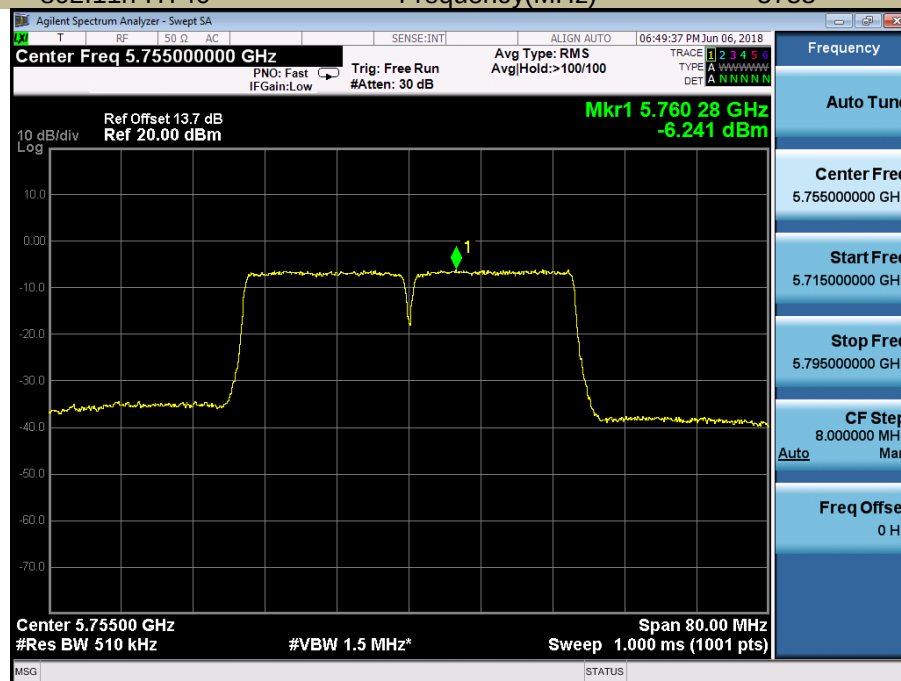
Power Spectral Density U-NII - 3
Test Model 802.11ac(HT20) Frequency(MHz) 5785



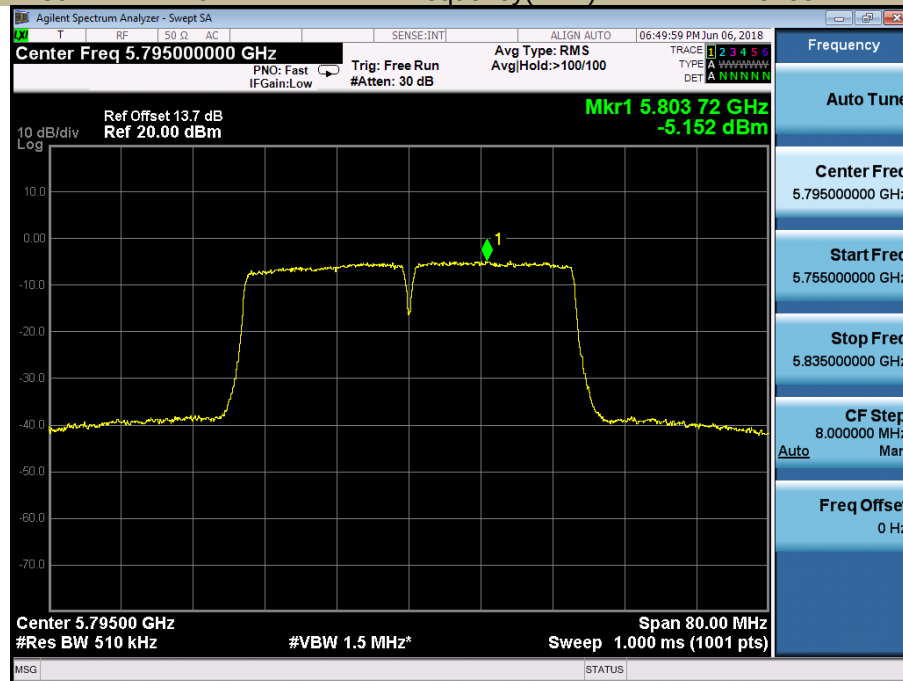
Power Spectral Density
Test Model 802.11ac(HT20) U-NII - 3
Frequency(MHz) 5825



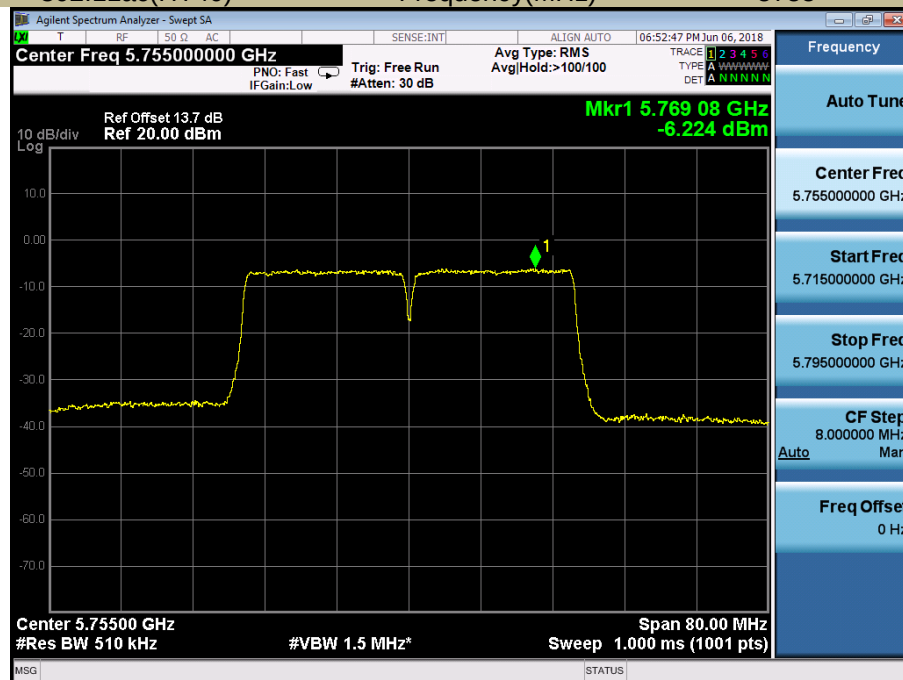
Power Spectral Density
Test Model 802.11n-HT40 U-NII - 3
Frequency(MHz) 5755



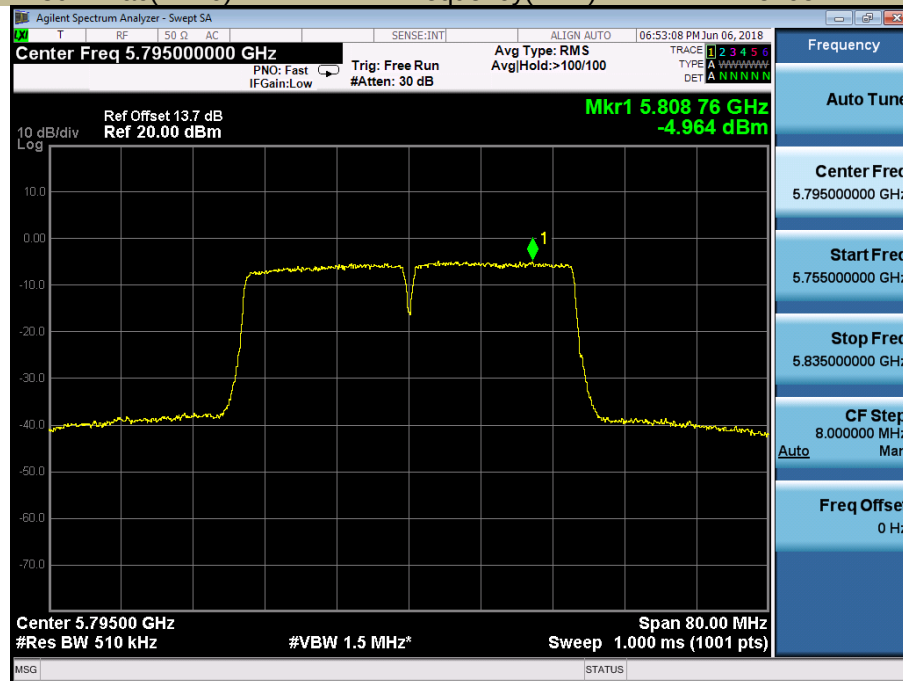
Power Spectral Density U-NII - 3
Test Model 802.11n-HT40 Frequency(MHz) 5795



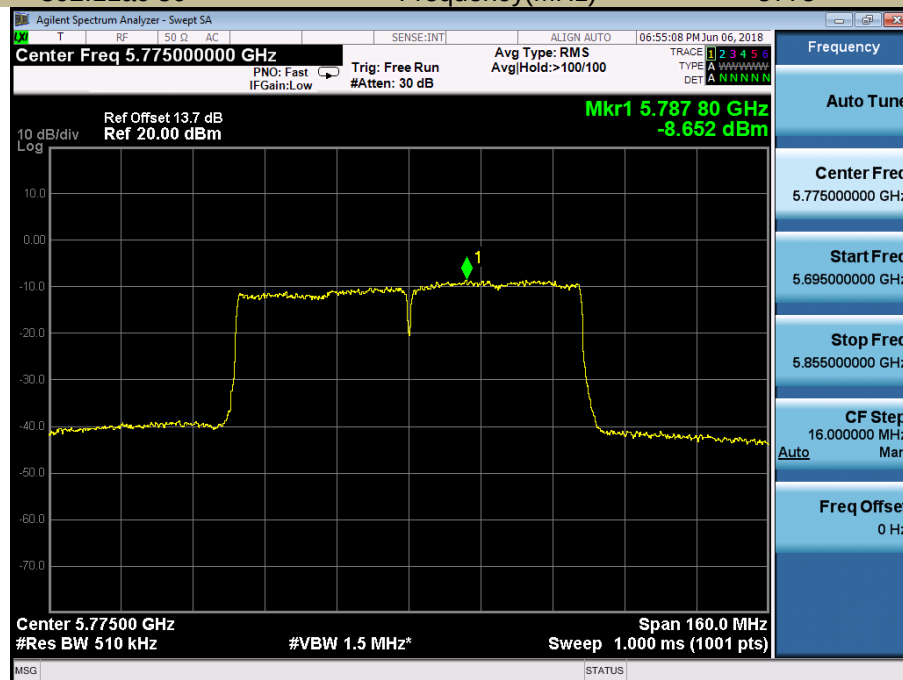
Power Spectral Density U-NII - 3
Test Model 802.11ac(HT40) Frequency(MHz) 5755



Power Spectral Density U-NII - 3
Test Model 802.11ac(HT40) Frequency(MHz) 5795



Power Spectral Density U-NII - 3
Test Model 802.11ac 80 Frequency(MHz) 5775

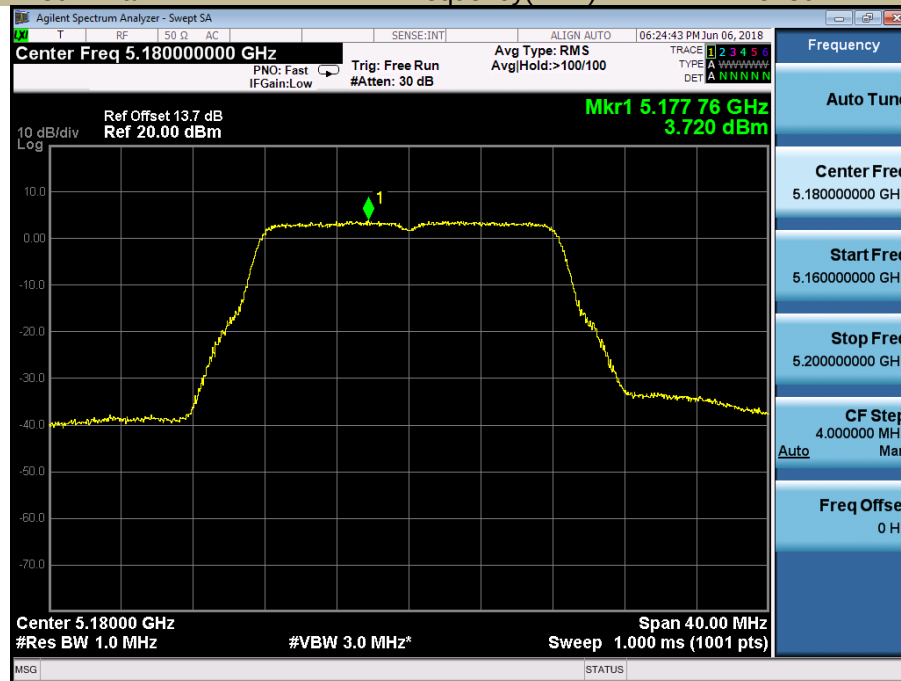


1T1R - Antenna B

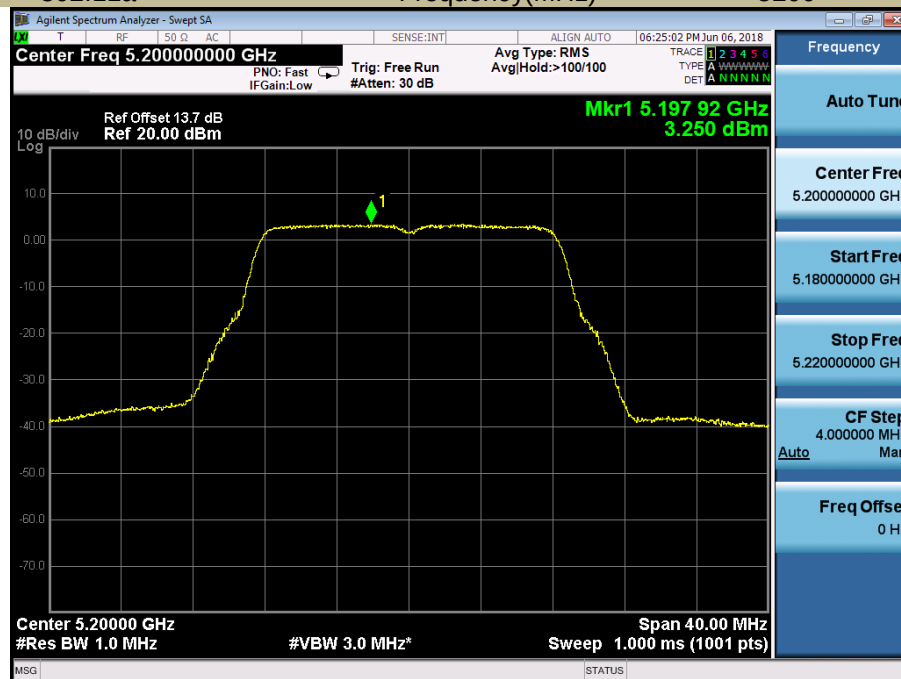
5150-5250MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5180	3.720	11
	5200	3.250	11
	5240	2.643	11
802.11n-HT20	5180	3.046	11
	5200	2.845	11
	5240	2.133	11
802.11ac(VHT20)	5180	-0.029	11
	5200	0.074	11
	5240	-0.642	11
802.11n-HT40	5190	-0.200	11
	5230	-1.056	11
802.11ac(VHT40)	5190	-0.469	11
	5230	-1.268	11
802.11ac(VHT80)	5210	-4.593	11

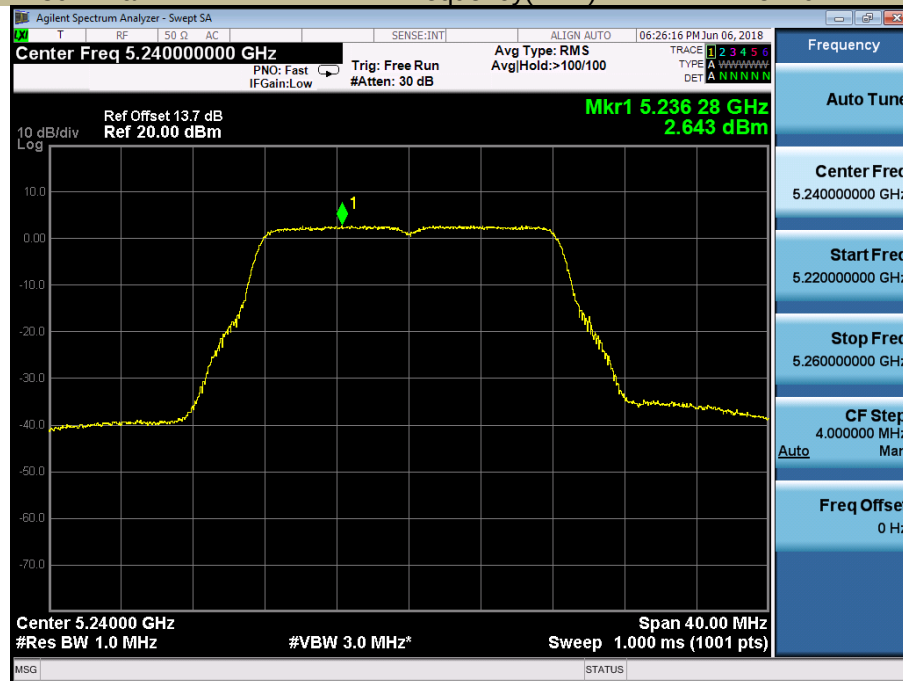
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5180



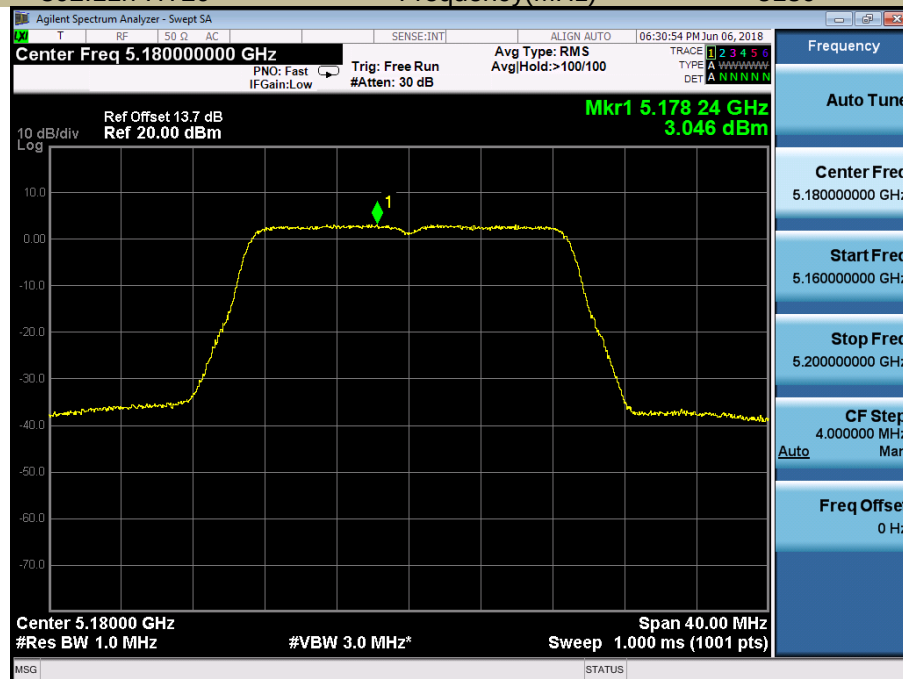
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5200



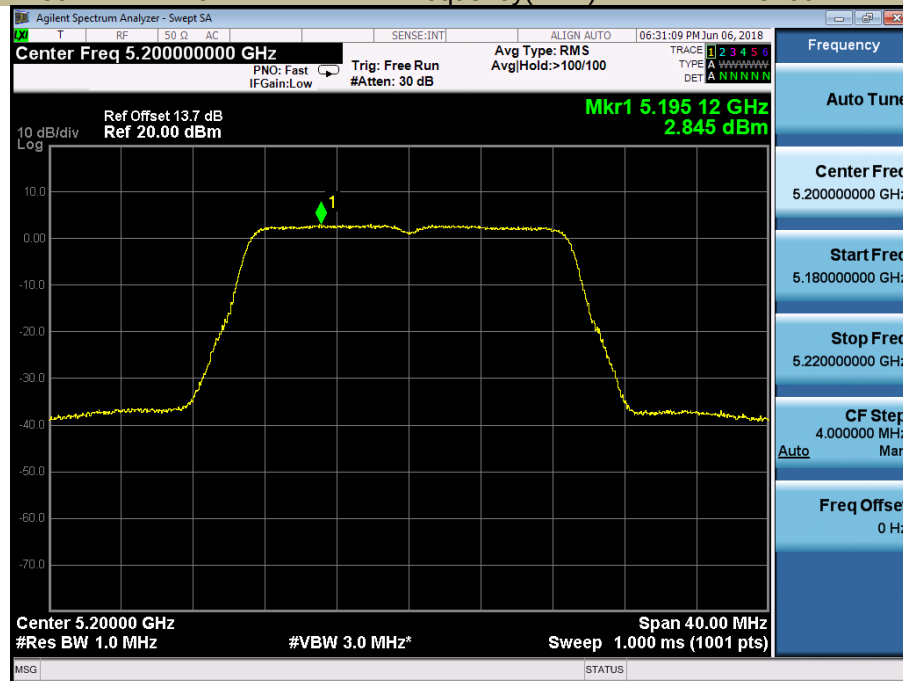
Power Spectral Density U-NII - 1
Test Model 802.11a Frequency(MHz) 5240



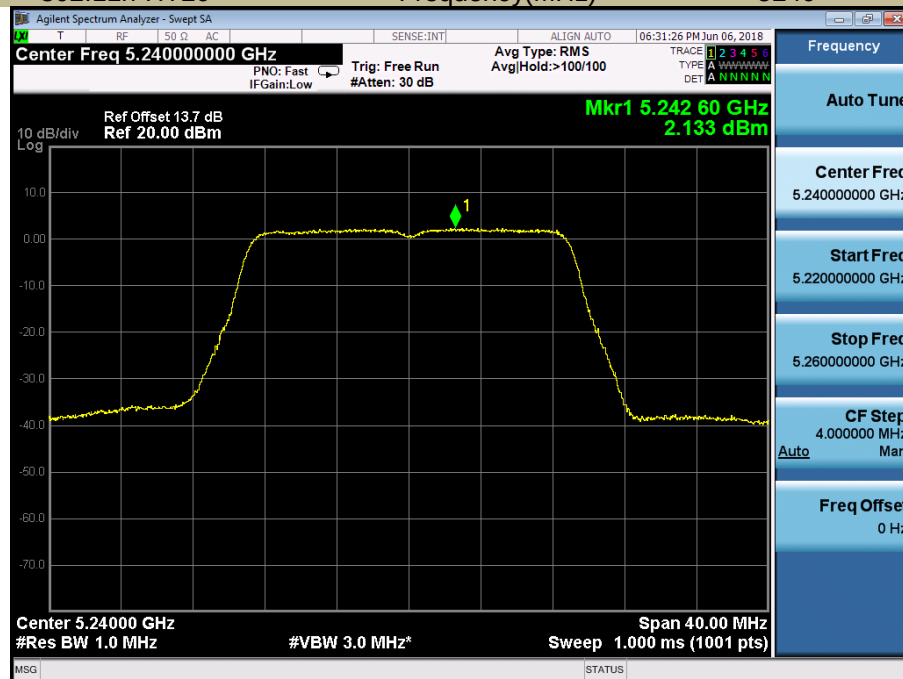
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5180



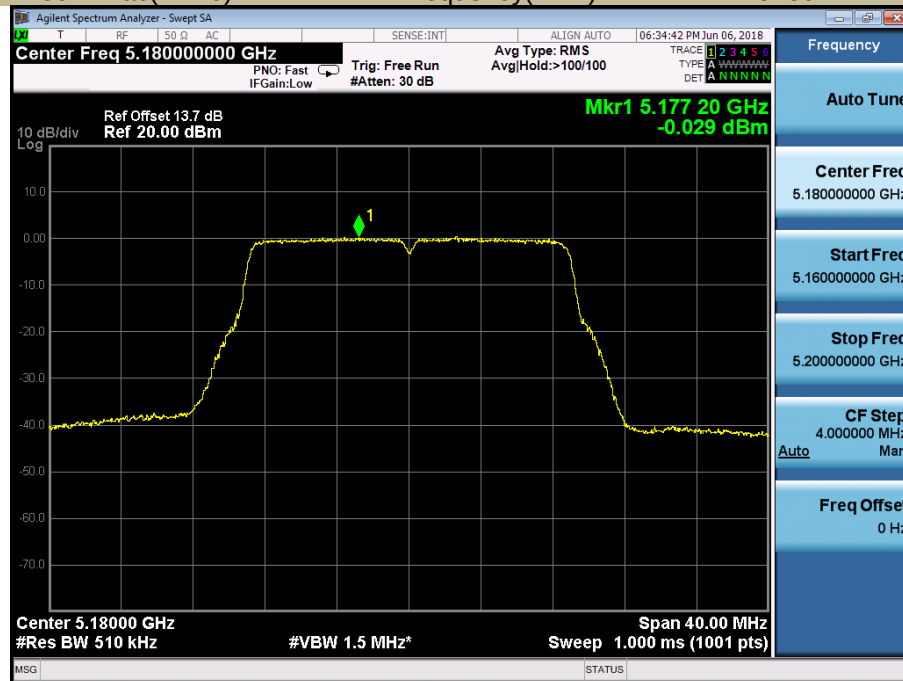
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5200



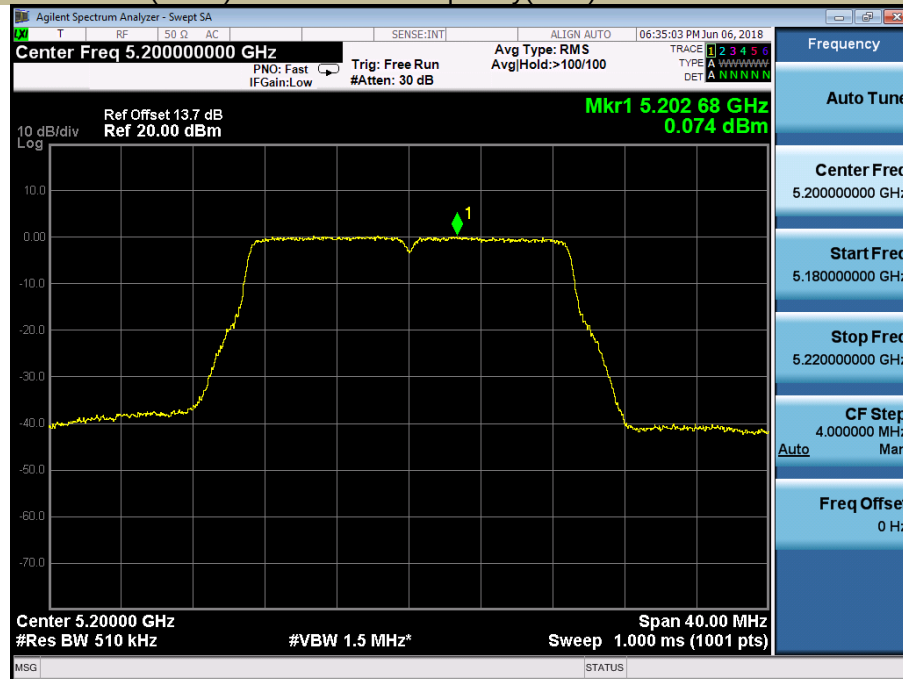
Power Spectral Density U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5240



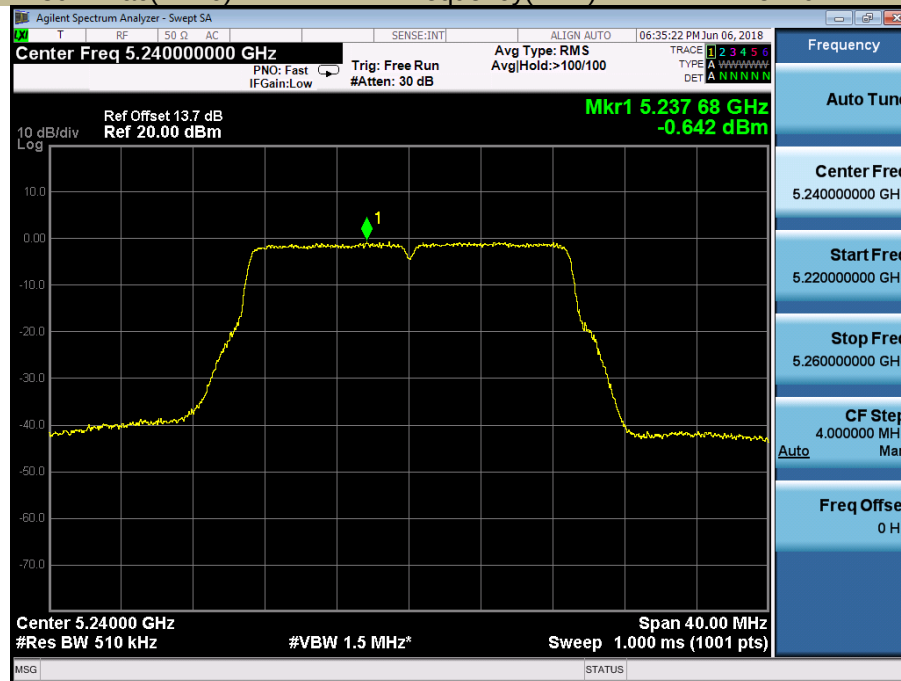
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5180



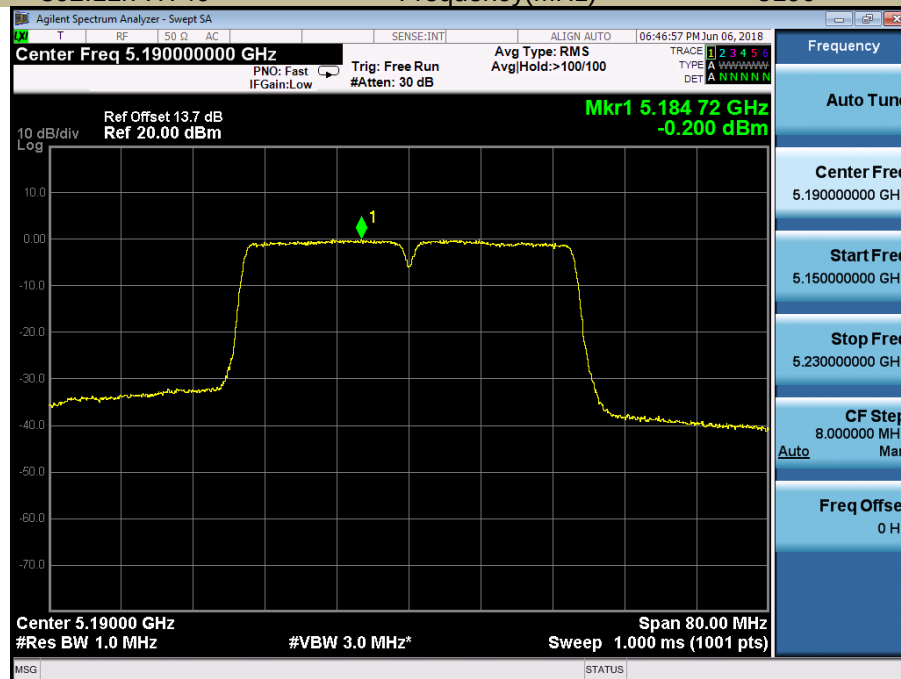
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5200



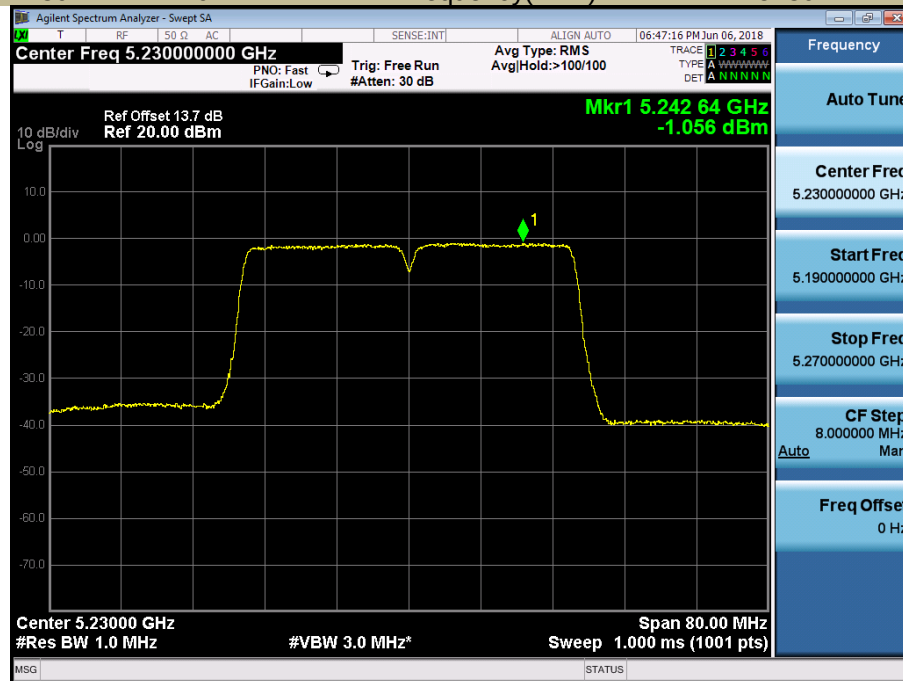
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5240



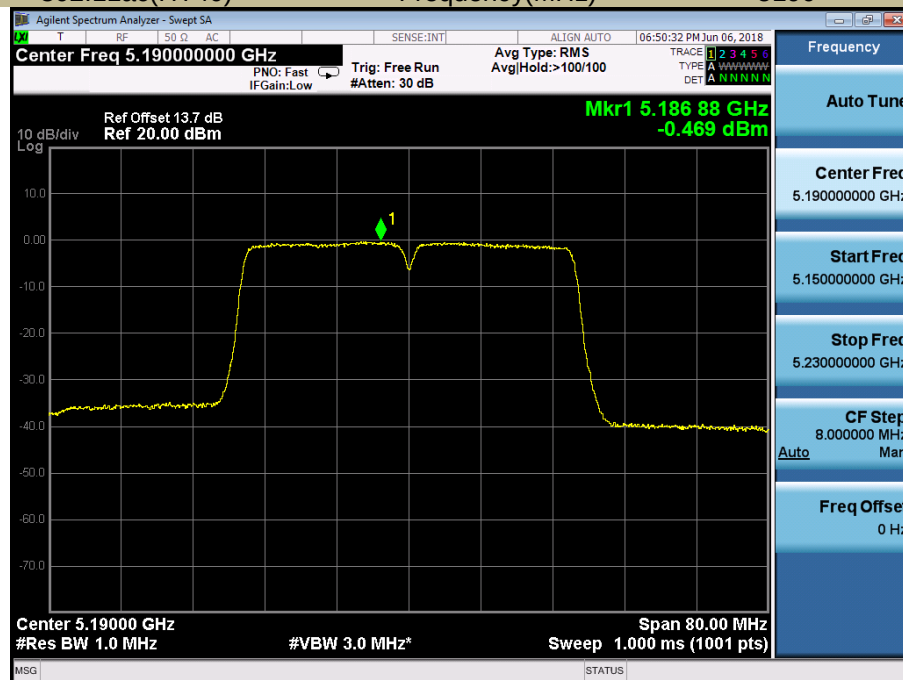
Power Spectral Density U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5190



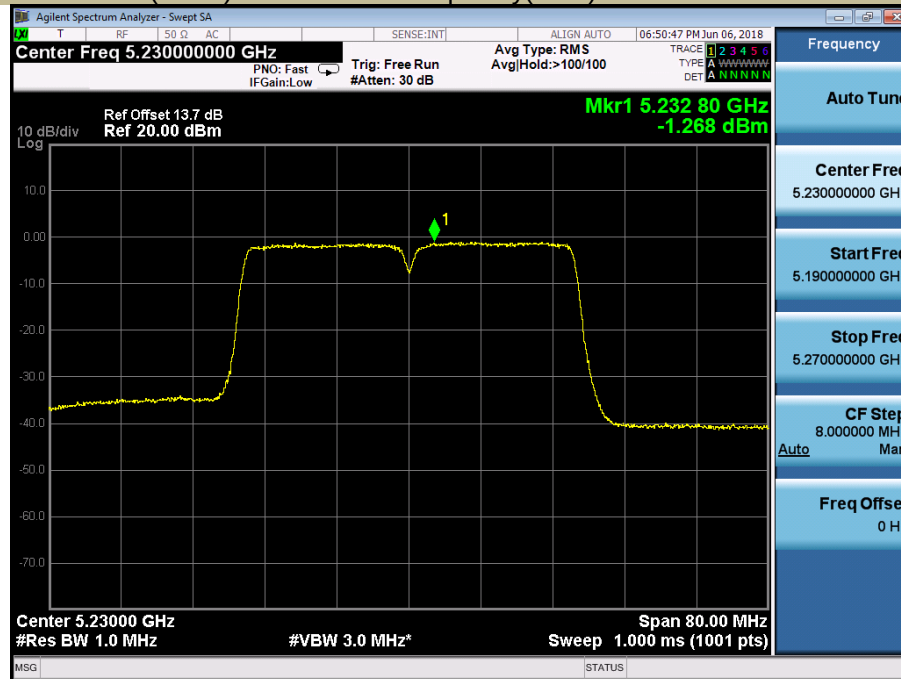
Power Spectral Density U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5230



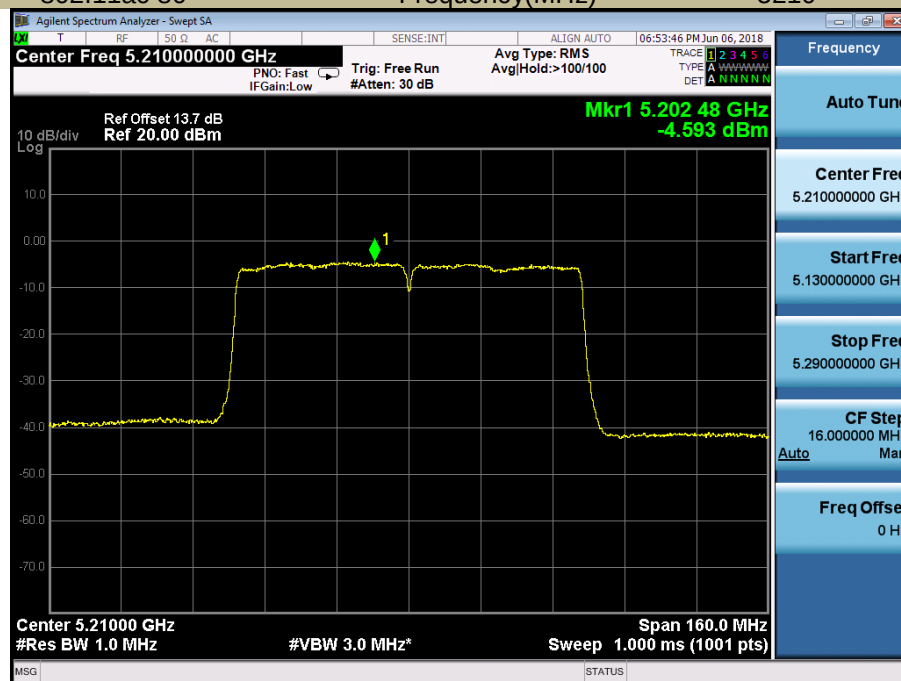
Power Spectral Density U-NII - 1
Test Model 802.11ac(HT40) Frequency(MHz) 5190



Power Spectral Density U-NII - 1
Test Model 802.11ac(HT40) Frequency(MHz) 5230



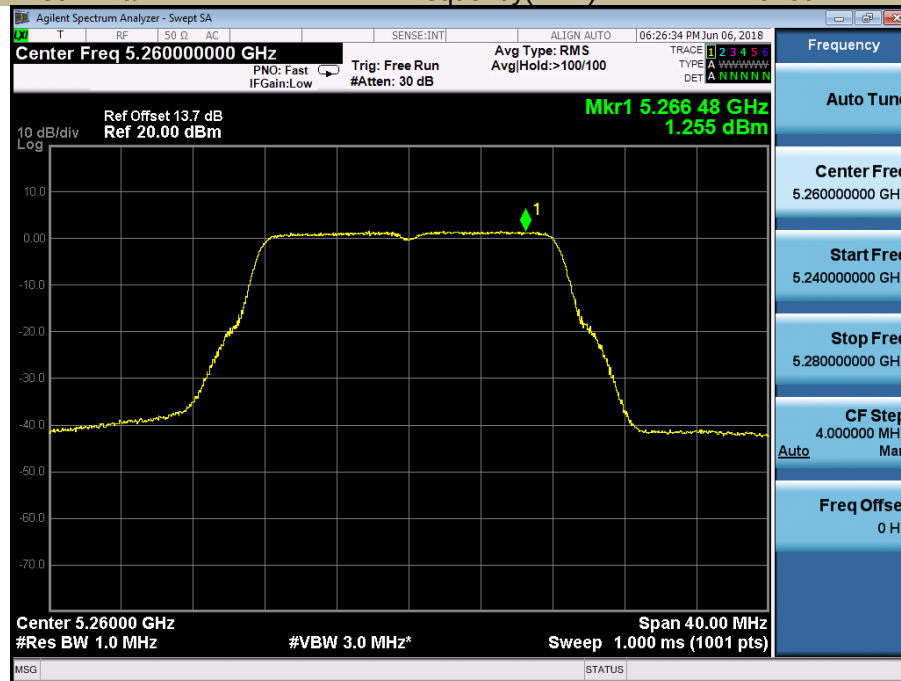
Power Spectral Density U-NII - 1
Test Model 802.11ac 80 Frequency(MHz) 5210



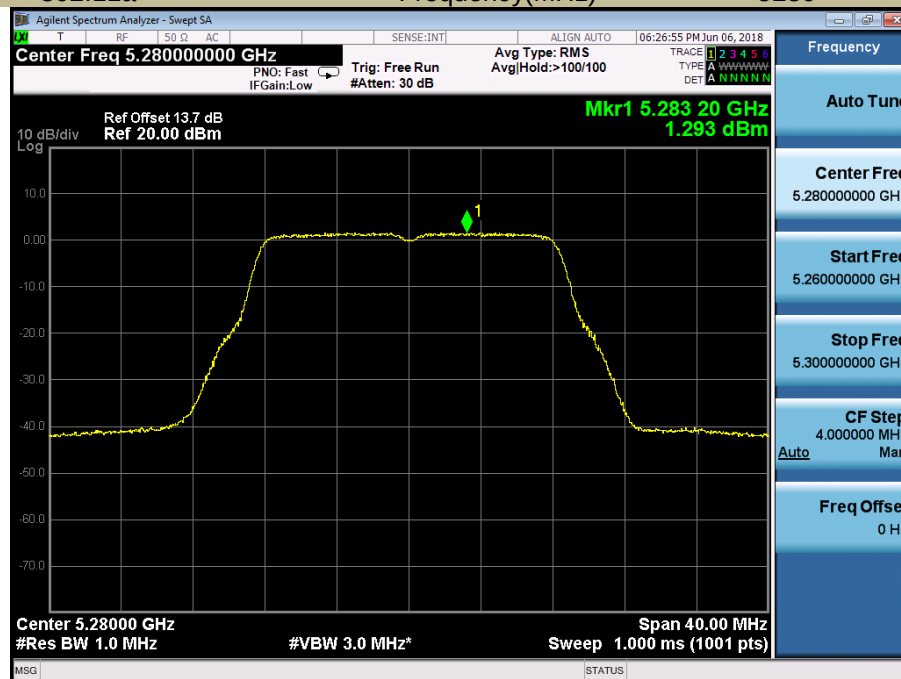
5250-5350MHz

Operating mode	Test Channel	Power Spectral Density dBm/MHz	Limit (dBm/MHz)
802.11a	5260	1.255	11
	5280	1.293	11
	5320	0.915	11
802.11n-HT20	5260	0.897	11
	5280	1.103	11
	5320	0.594	11
802.11ac(VHT20)	5260	0.786	11
	5280	1.099	11
	5320	0.332	11
802.11n-HT40	5270	-1.126	11
	5310	-1.448	11
802.11ac(VHT40)	5270	-1.349	11
	5310	-1.597	11
802.11ac(VHT80)	5290	-5.282	11

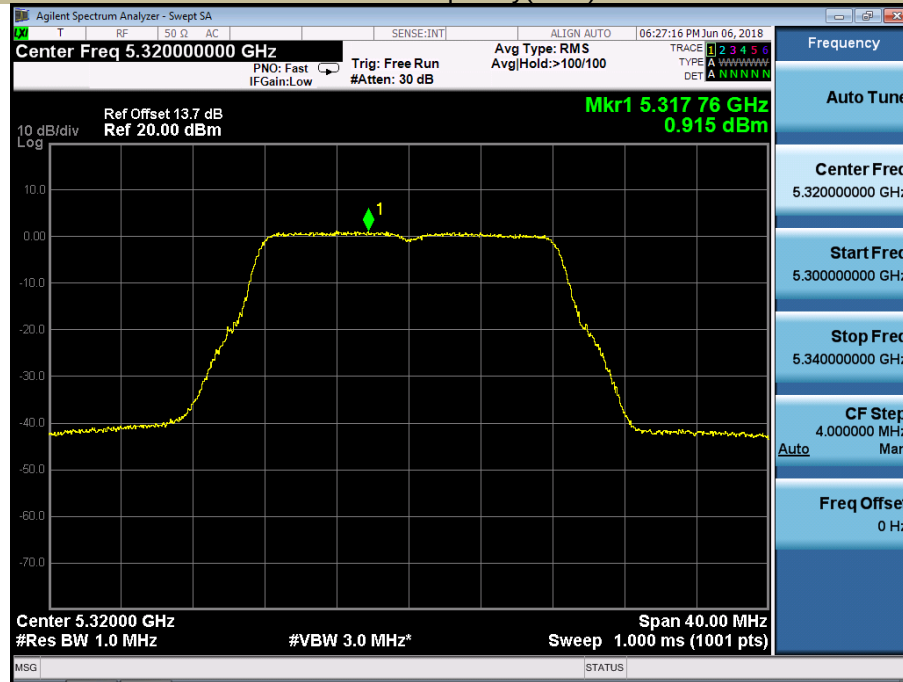
Power Spectral Density
Test Model 802.11a
U-NII – 2A
Frequency(MHz) 5260



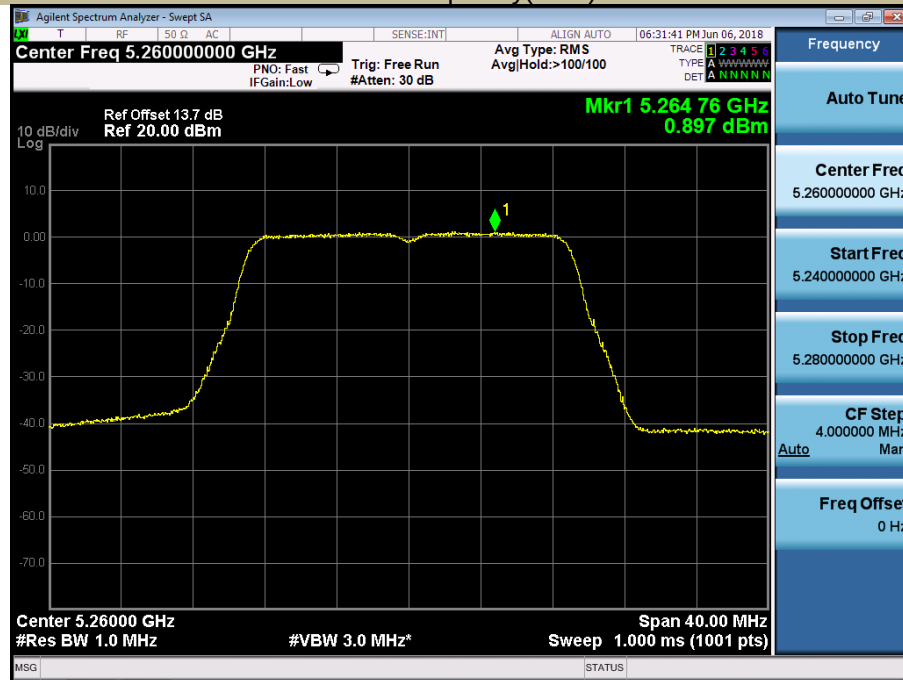
Power Spectral Density
Test Model 802.11a
U-NII – 2A
Frequency(MHz) 5280



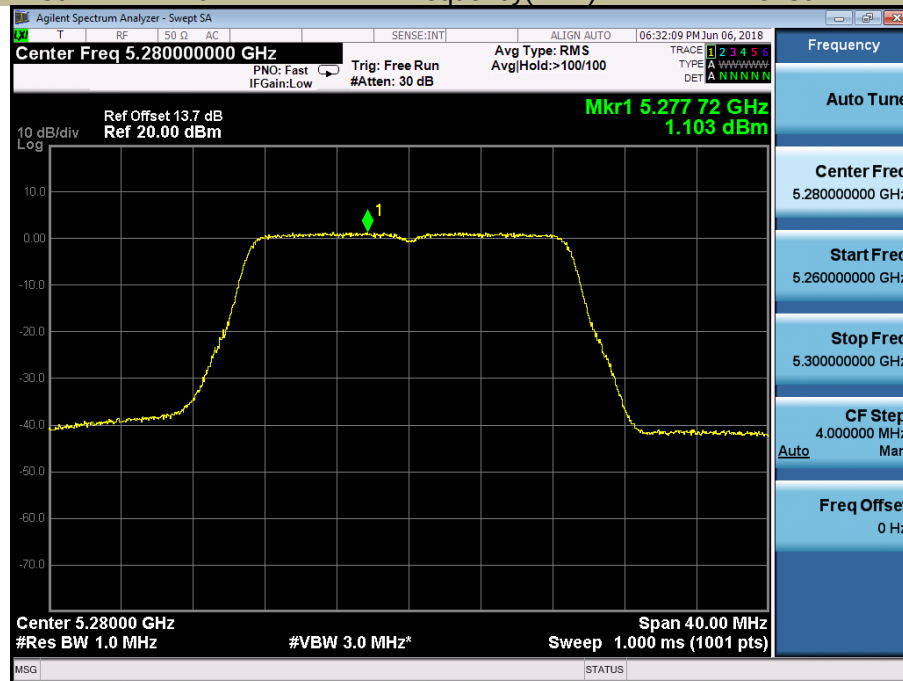
Power Spectral Density U-NII – 2A
Test Model 802.11a Frequency(MHz) 5320



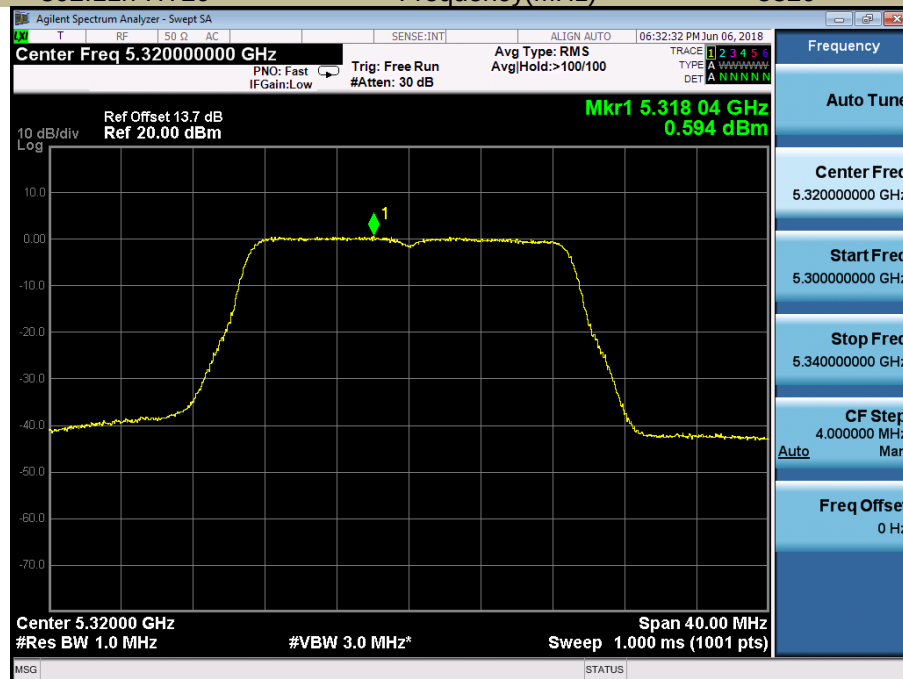
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5260



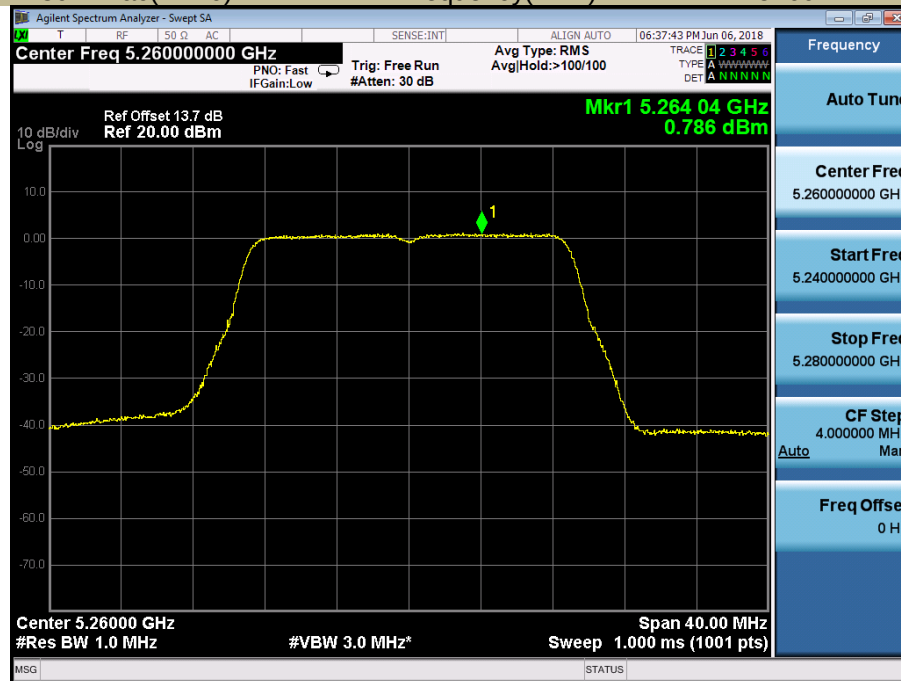
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5280



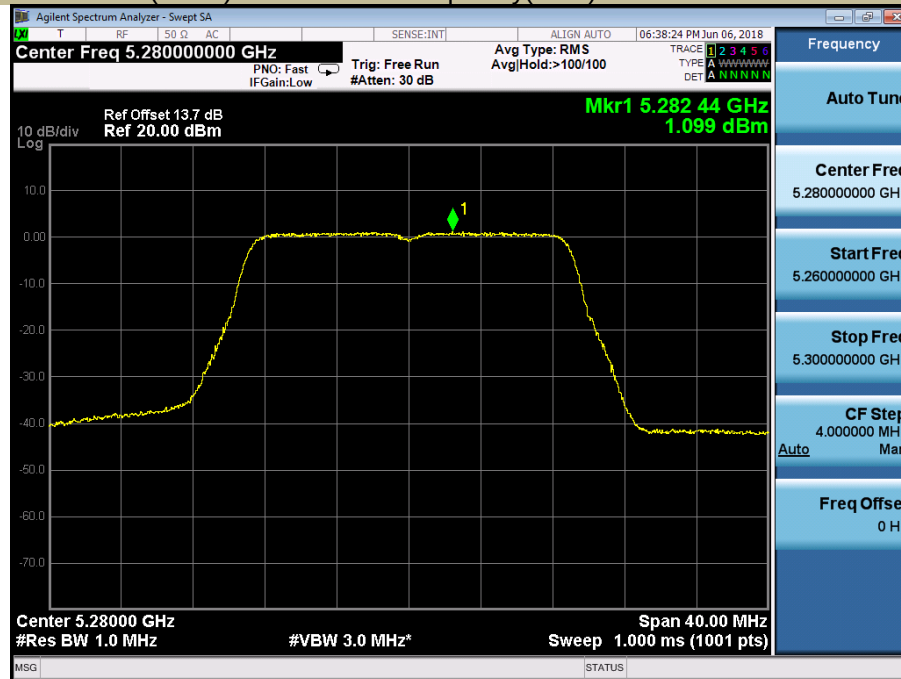
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5320



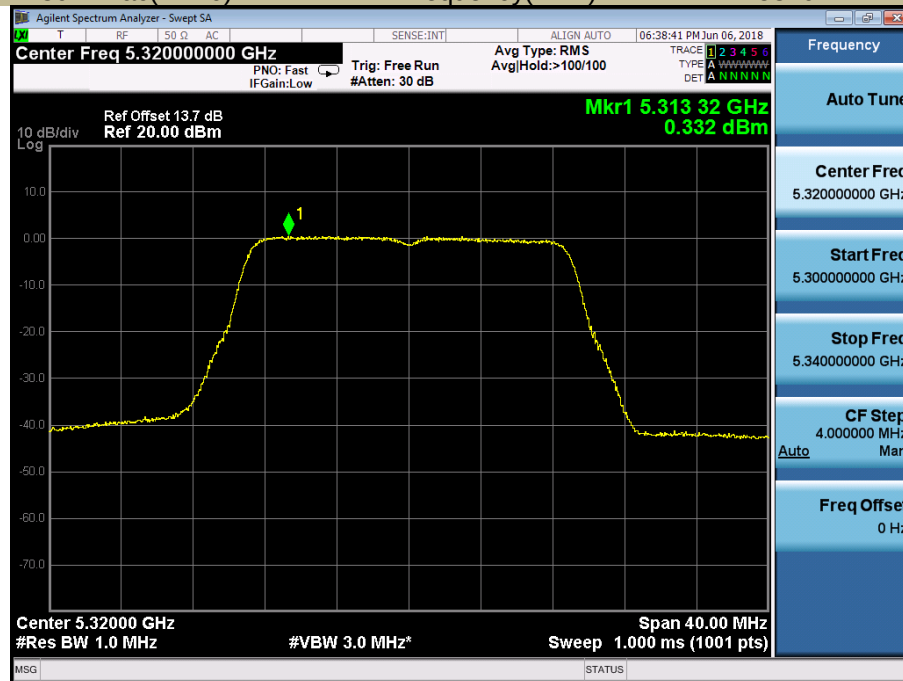
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5260



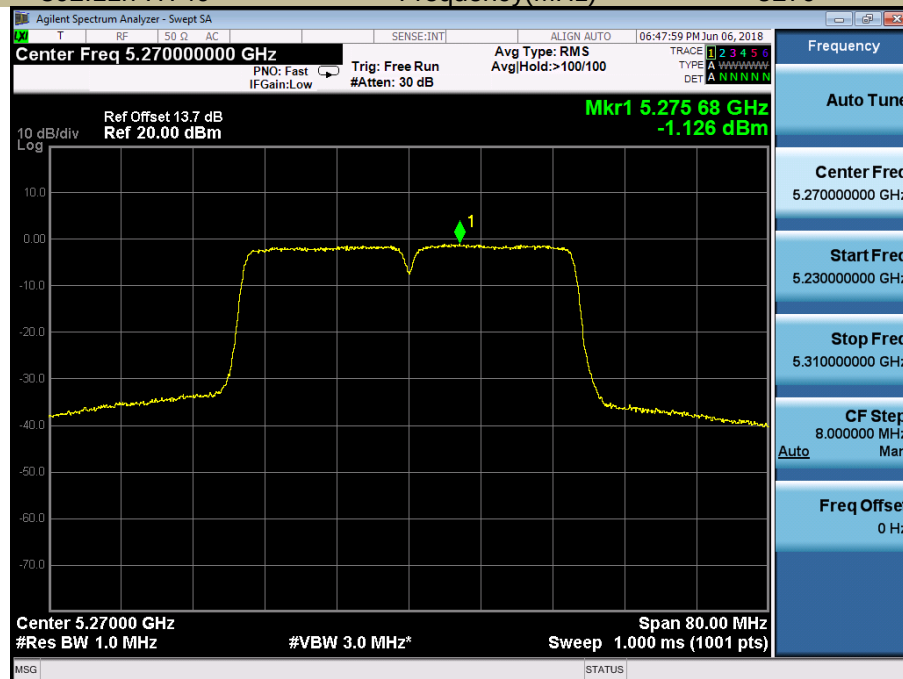
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5280



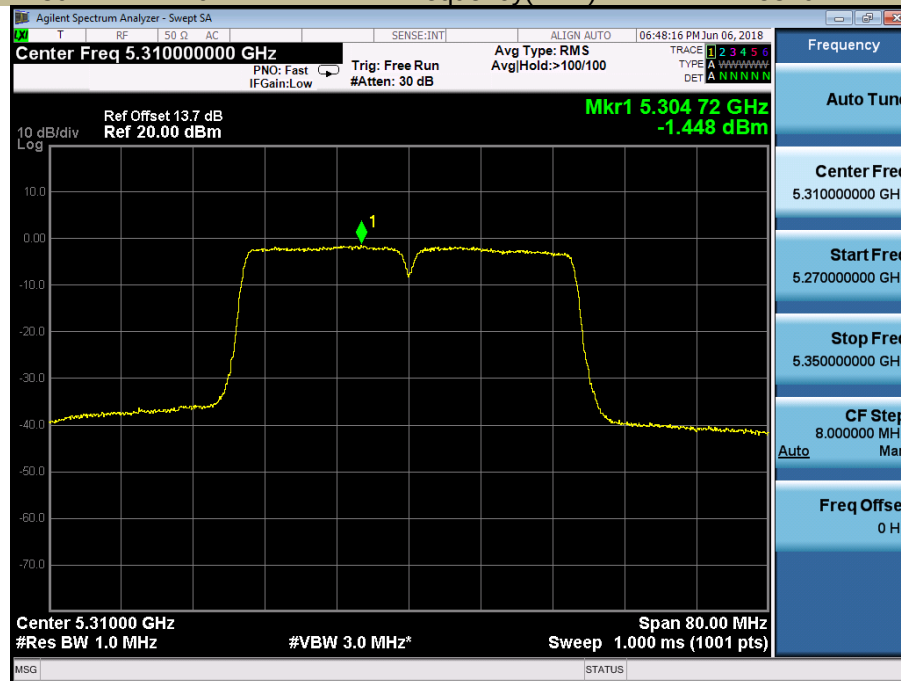
Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5320



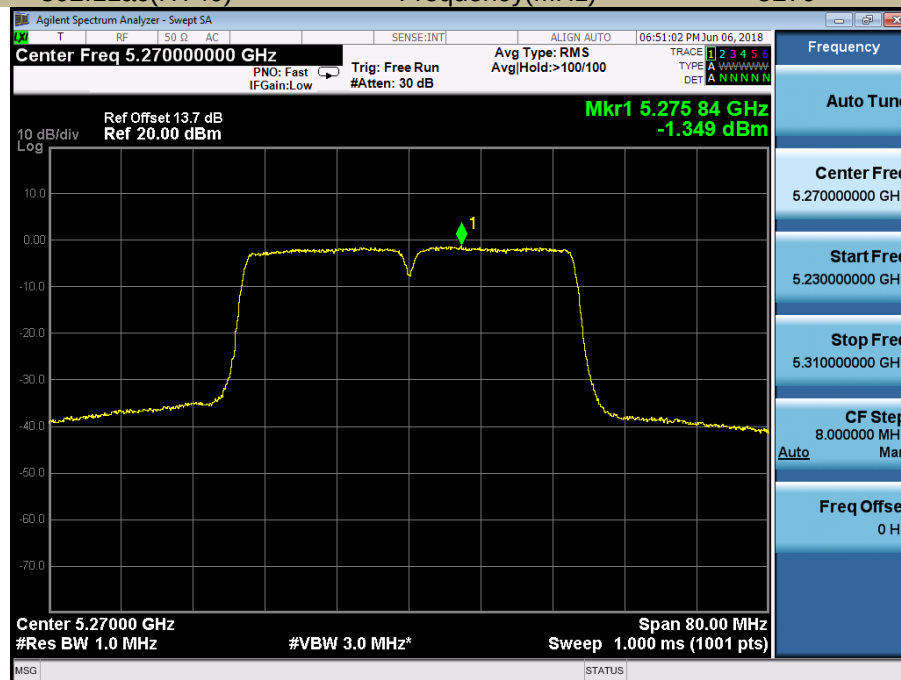
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5270



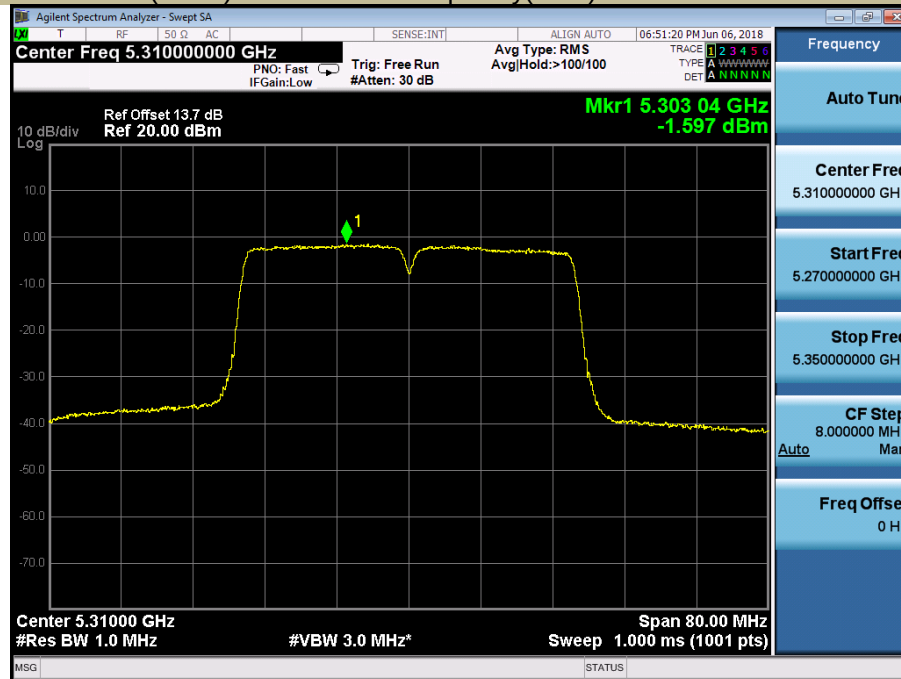
Power Spectral Density U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5310



Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5270



Power Spectral Density U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5310



Power Spectral Density U-NII – 2A
Test Model 802.11ac 80 Frequency(MHz) 5290

