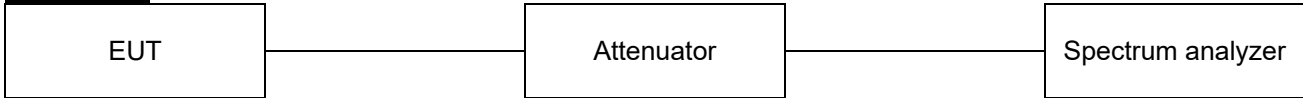


7.2. Maximum Power Spectral Density

Test setup



Limit

According to §15.407(a)

Band	EUT category		Limit
UNII-1		Outdoor access point	17dBm/MHz
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /MHz
UNII-2A		√	11 dBm /MHz
UNII-2C		√	11 dBm /MHz
UNII-3		√	30 dBm /500 kHz

Notes:

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain if the antenna exceed 6 dBi

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
 KDB 789033 D02 v02r01 - Section F
 KDB 662911 D01 v02r01 - Section E). 2)

Test settings

Section F

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power...” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Search function on the instrument to find the peak of the spectrum and record its value.
3. Adjustments to the peak value of the spectrum, if applicable:
 - a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.
 - b) If Method SA-3 Alternative was used and the linear mode was used in II.E.2.g) (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1MHz reference bandwidth
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the

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preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 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 RBWs less than 1MHz, 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 II.B.1.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 II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.

Test results

Test mode	Band	Frequency (MHz)	Measured PSD (dB m/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dB m/MHz)
802.11a	UNII-1	5 180	4.43	0.14	4.57	11
		5 200	5.43	0.14	5.57	
		5 240	5.65	0.14	5.79	
	UNII-2A	5 260	5.67	0.14	5.81	11
		5 280	5.64	0.14	5.78	
		5 320	6.09	0.14	6.23	
	UNII-2C	5 500	6.64	0.14	6.78	11
		5 600	6.74	0.14	6.88	
		5 700	3.92	0.14	4.06	
802.11n HT20	UNII-1	5 180	4.04	0.15	4.19	11
		5 200	4.10	0.15	4.25	
		5 240	4.54	0.15	4.69	
	UNII-2A	5 260	4.18	0.15	4.33	11
		5 280	4.36	0.15	4.51	
		5 320	4.39	0.15	4.54	
	UNII-2C	5 500	5.14	0.15	5.29	11
		5 600	5.58	0.15	5.73	
		5 700	4.48	0.15	4.63	
802.11n HT40	UNII-1	5 190	-1.02	0.29	-0.73	11
		5 230	0.42	0.29	0.71	
	UNII-2A	5 270	-0.04	0.29	0.25	11
		5 310	-0.86	0.29	-0.57	
	UNII-2C	5 510	1.23	0.29	1.52	11
		5 590	1.05	0.29	1.34	
802.11ac VHT80	UNII-1	5 210	-5.35	0.57	-4.78	11
	UNII-2A	5 290	-4.95	0.57	-4.38	11
	UNII-2C	5 530	-3.42	0.57	-2.85	11
		5 610	-3.84	0.57	-3.27	

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Test mode	Band	Frequency (MHz)	Measured PSD (dBm)	Duty Factor (dB)	Maximum PSD (dBm /500 kHz)	Limit (dBm /500 kHz)
802.11a	UNII-3	5 745	1.20	0.14	1.34	30
		5 785	2.25	0.14	2.39	
		5 825	4.02	0.14	4.16	
802.11n HT20		5 745	1.20	0.15	1.35	
		5 785	2.36	0.15	2.51	
		5 825	2.40	0.15	2.55	
802.11n HT40		5 755	-1.75	0.29	-1.46	
		5 795	-1.75	0.29	-1.46	
802.11ac VHT80		5 775	-6.13	0.57	-5.56	

Notes:

- Maximum PSD calculation
- Maximum PSD = Measured PSD + DCF

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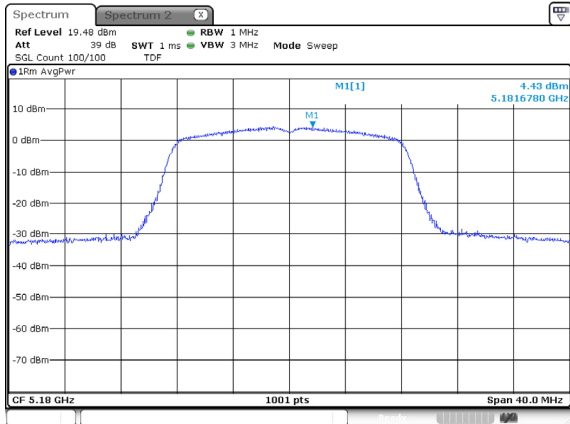
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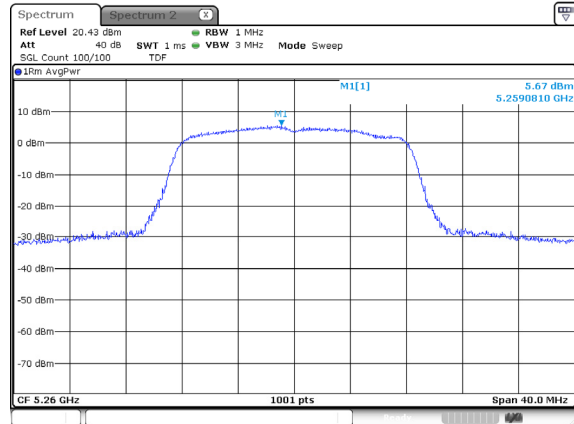
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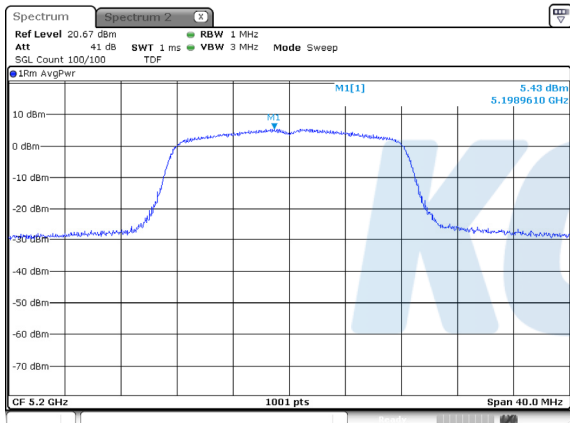
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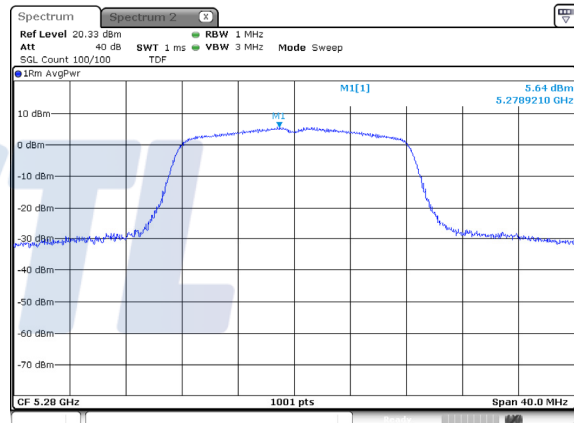
UNII-2A / 802.11a / Low ch.



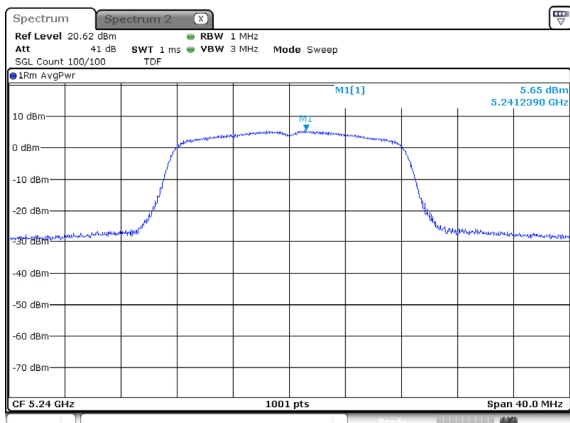
UNII-1 / 802.11a / Mid ch.



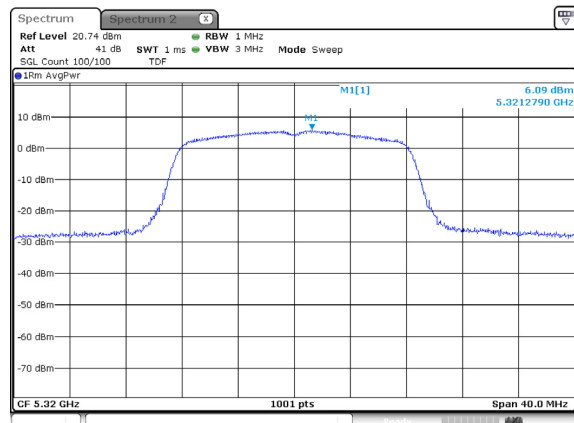
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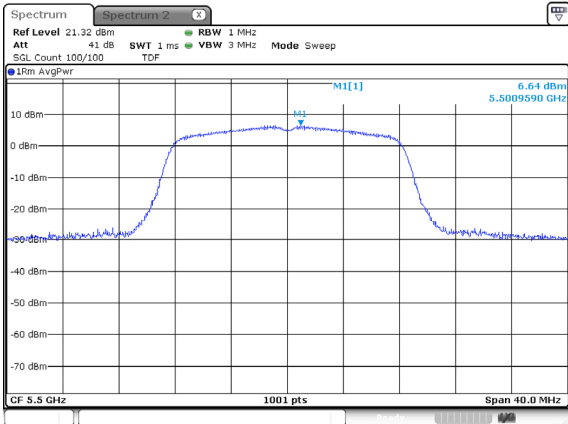
UNII-1 / 802.11a / High ch.



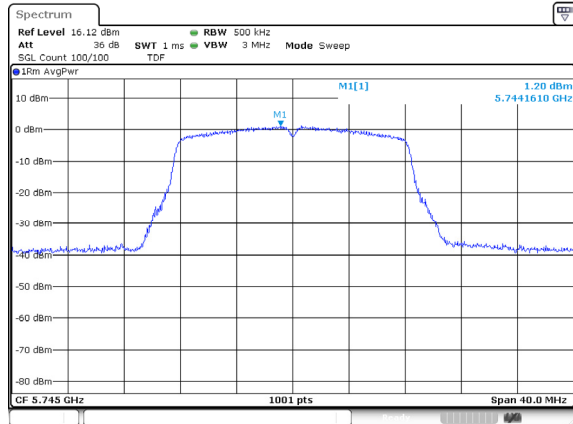
UNII-2A / 802.11a / High ch.



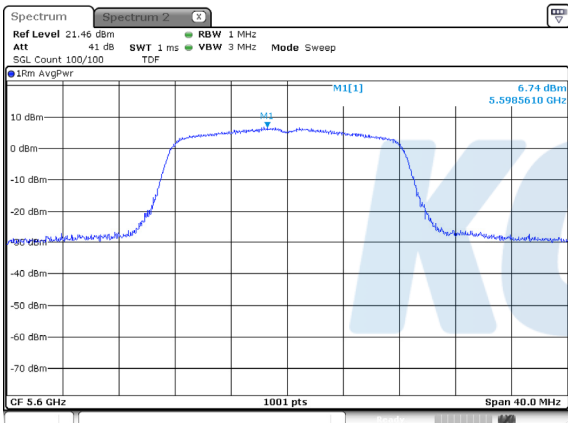
UNII-2C / 802.11a / Low ch.



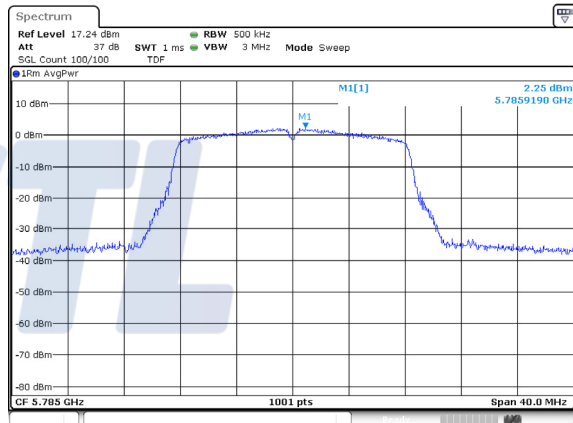
UNII-3 / 802.11a / Low ch.



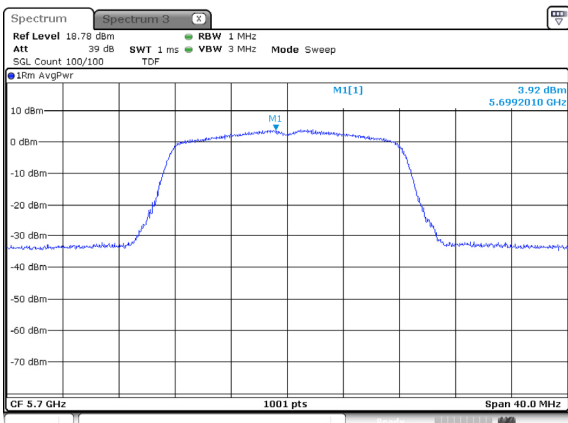
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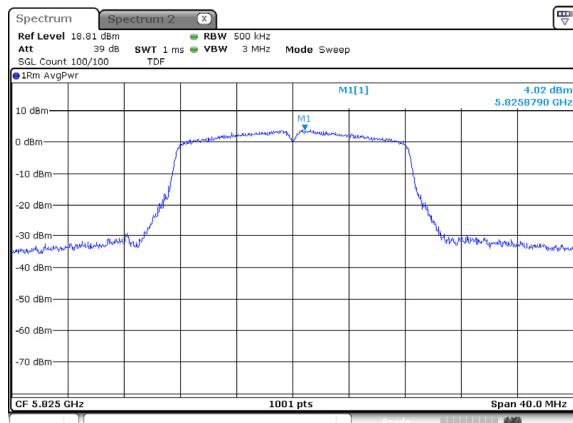
UNII-3 / 802.11a / Mid ch.



UNII-2C / 802.11a / High ch.



UNII-3 / 802.11a / High ch.



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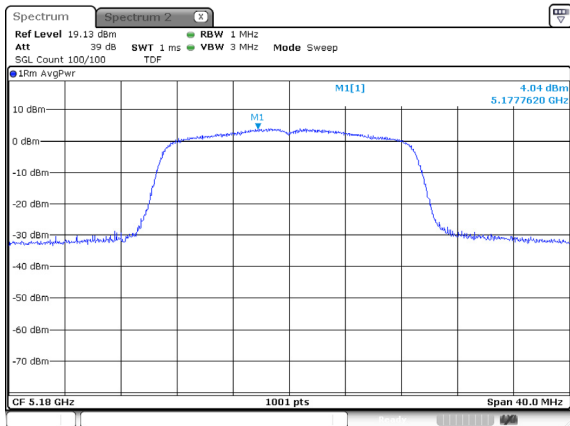
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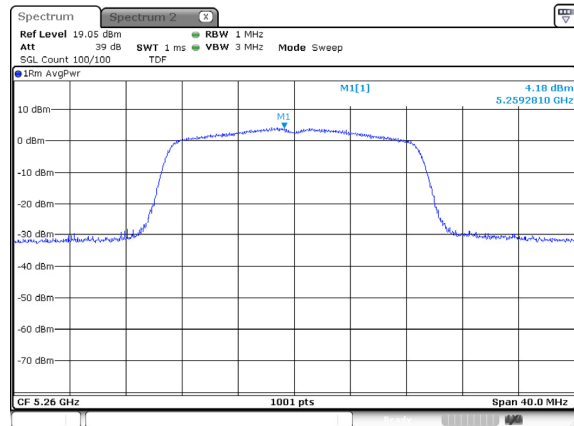
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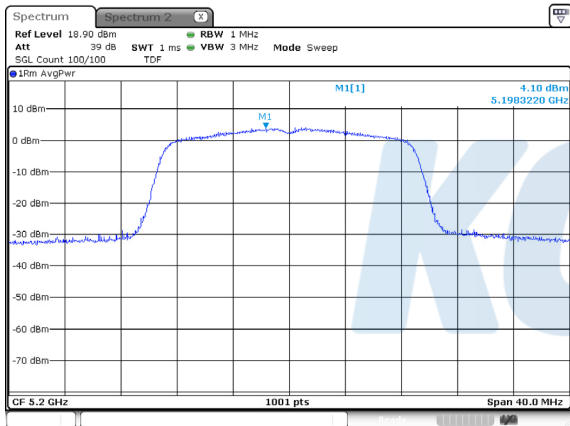
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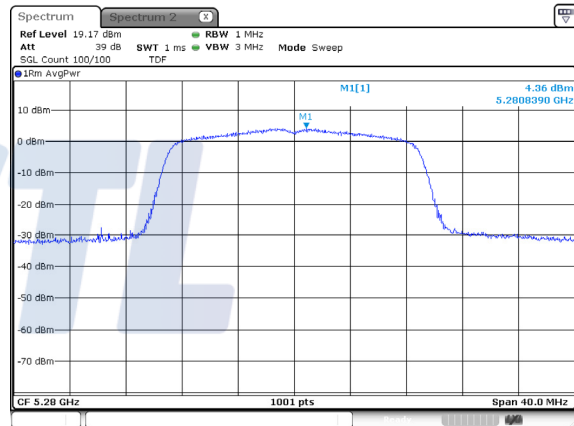
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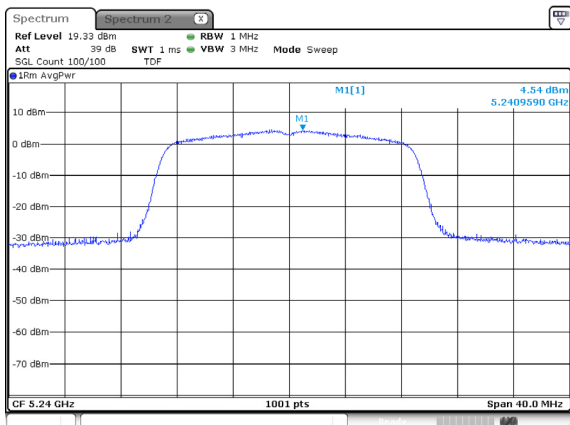
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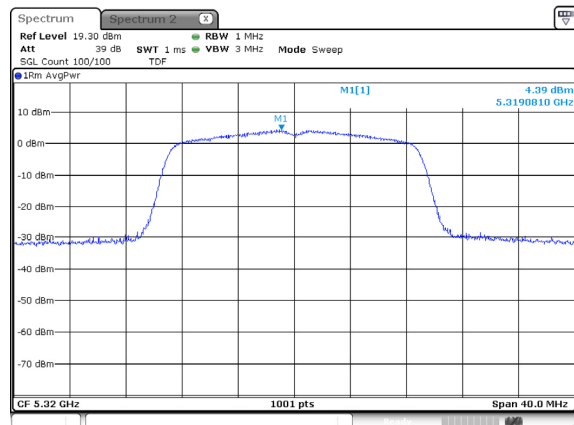
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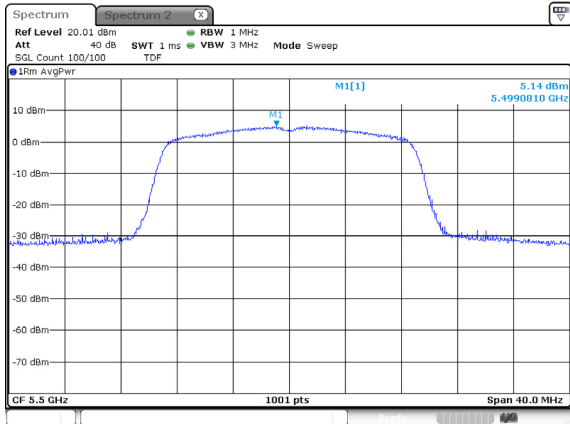
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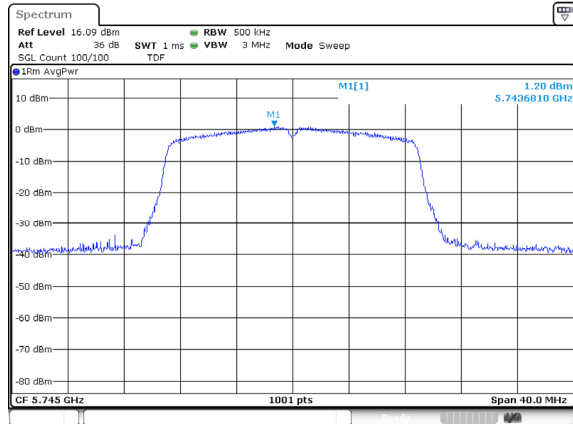
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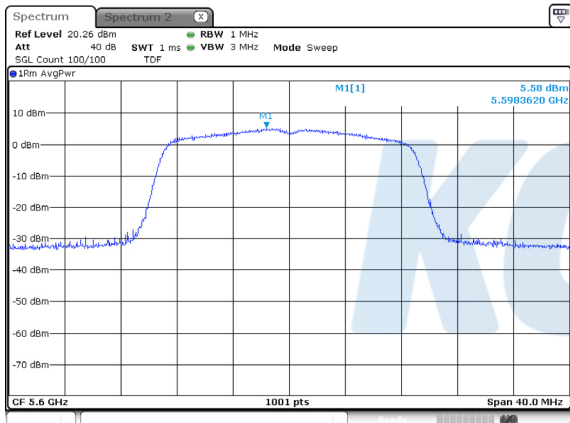
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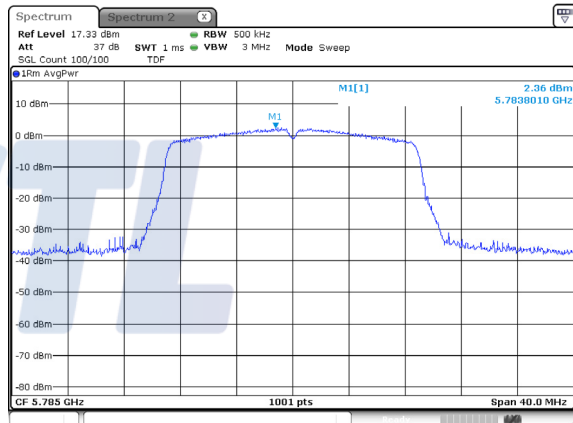
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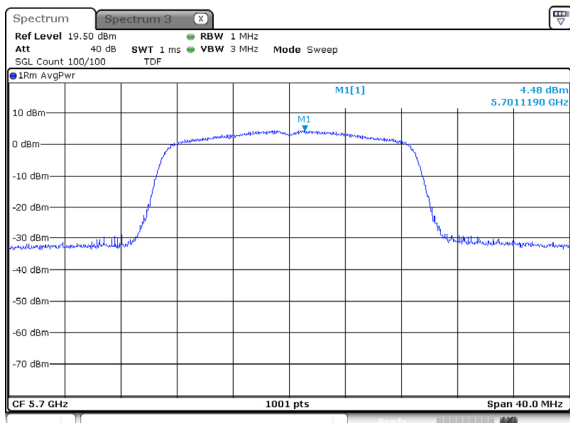
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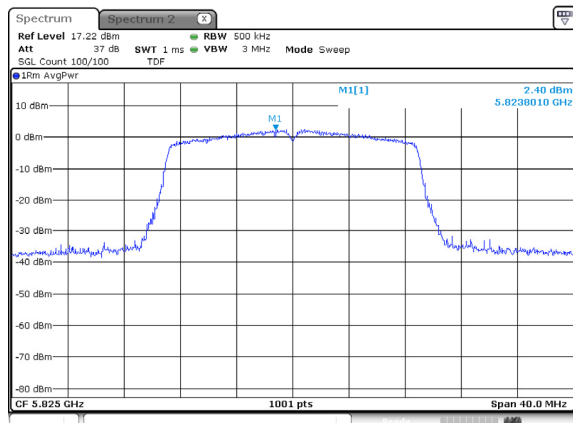
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UNII-2C / 802.11n HT20 / High ch.



UNII-3 / 802.11n HT20 / High ch.



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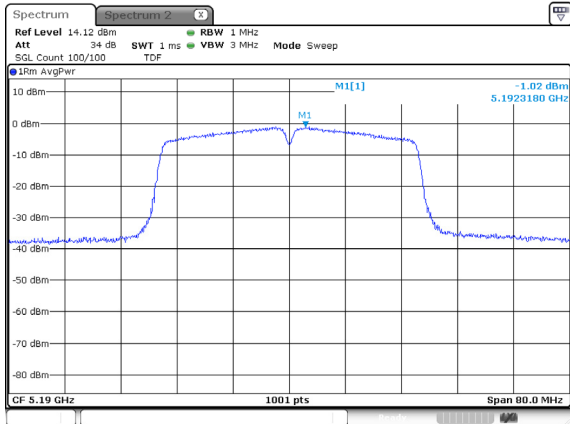
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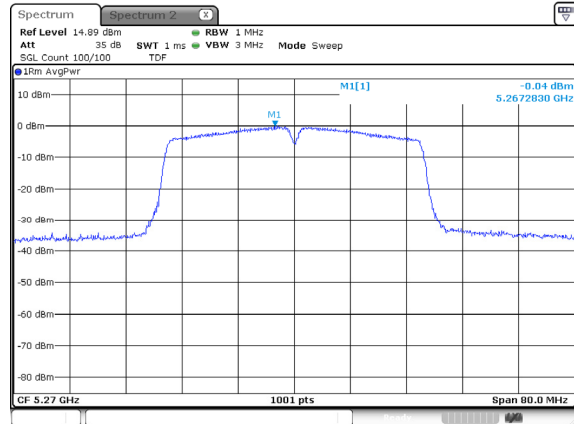
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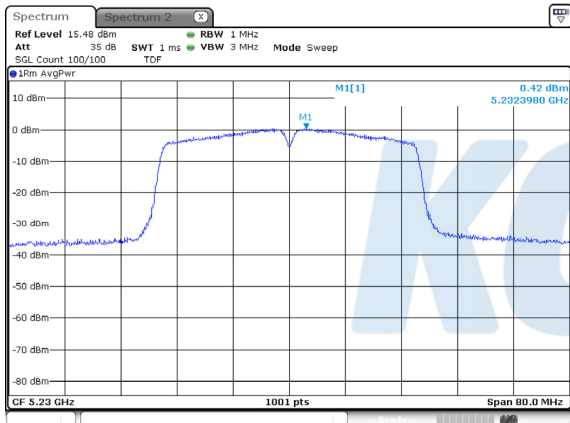
UNII-1 / 802.11n HT40 / Low ch.



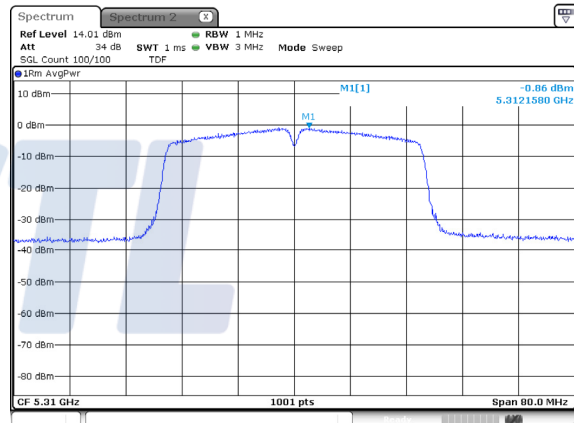
UNII-2A / 802.11n HT40 / Low ch.



UNII-1 / 802.11n HT40 / High ch.



UNII-2A / 802.11n HT40 / High ch.



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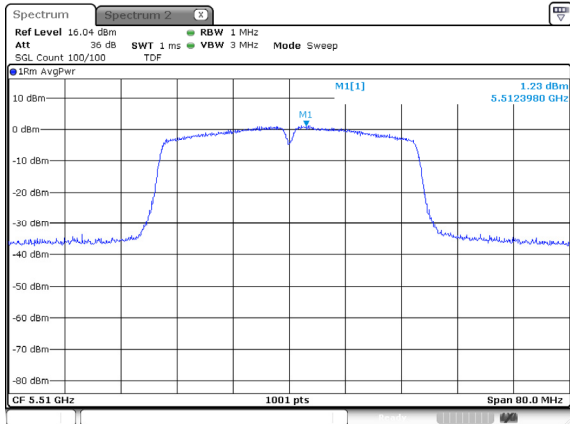
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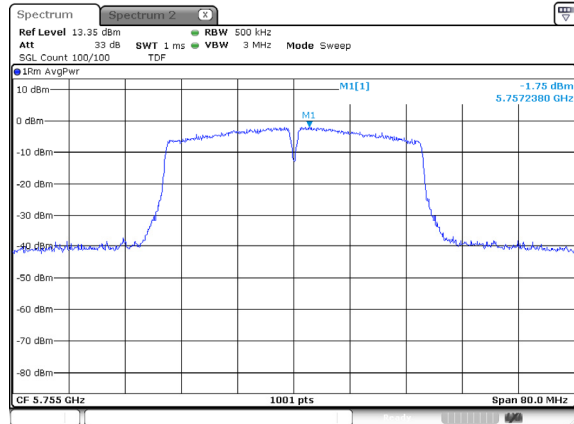
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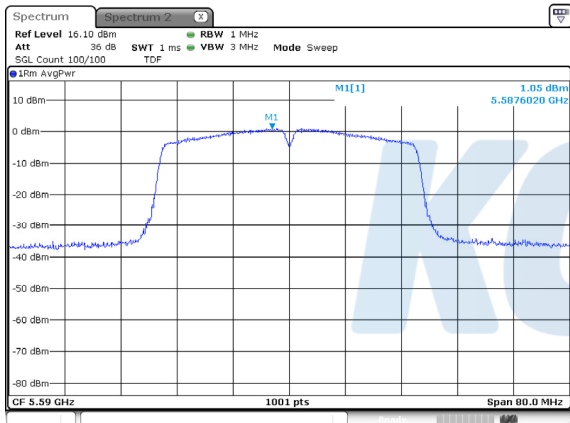
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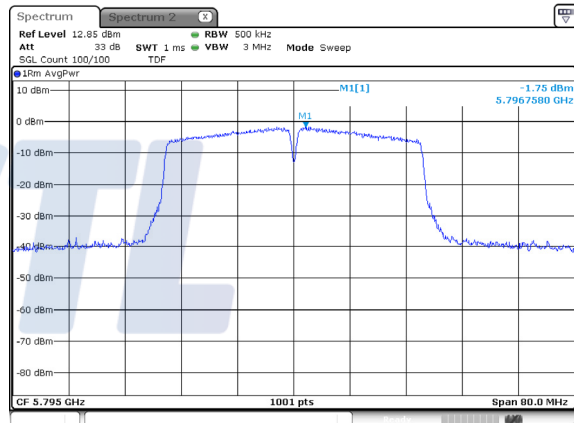
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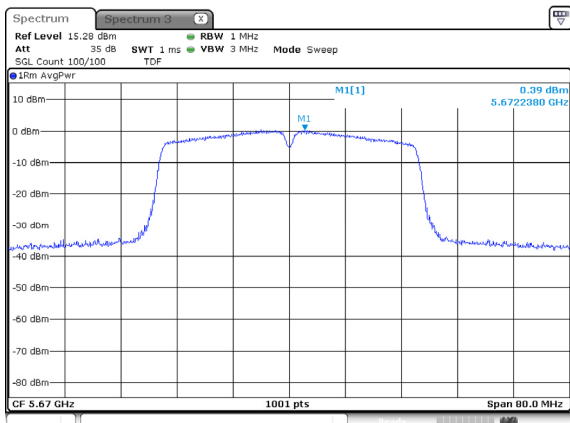
UNII-2C / 802.11n HT40 / Mid ch.



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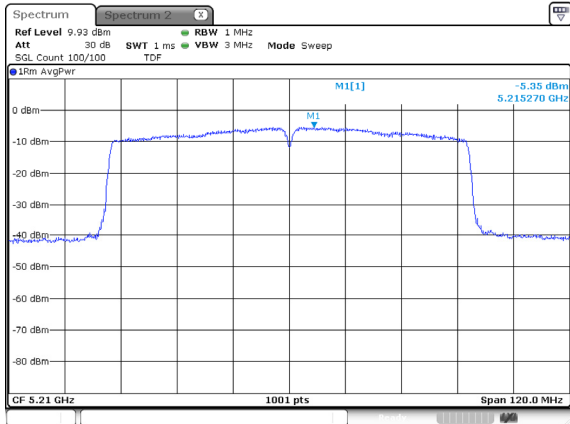
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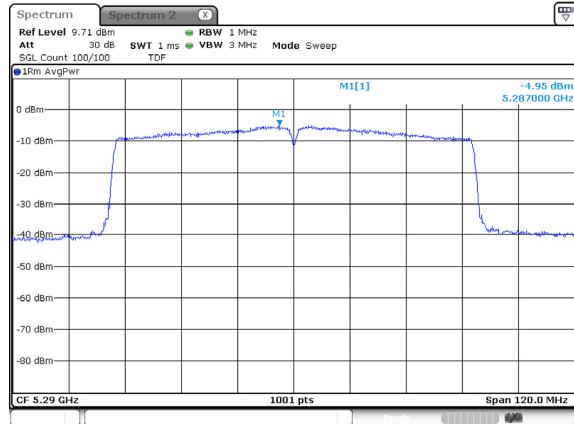
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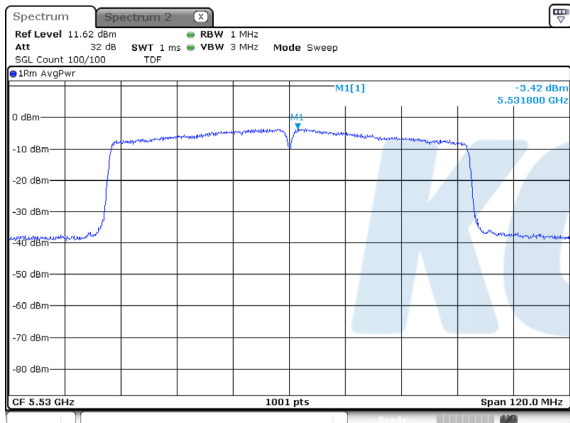
UNII-1 / 802.11ac VHT80 / Low ch.



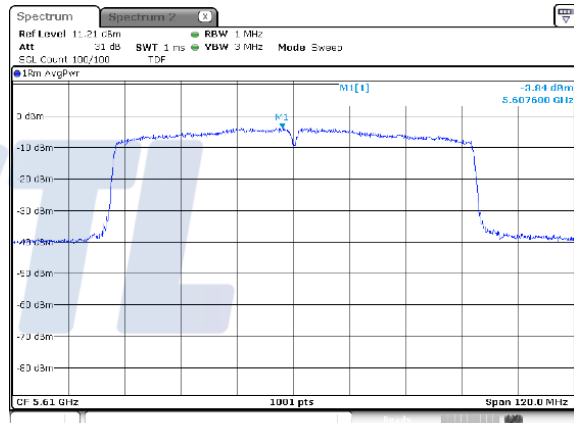
UNII-2A / 802.11ac VHT80 / Low ch.



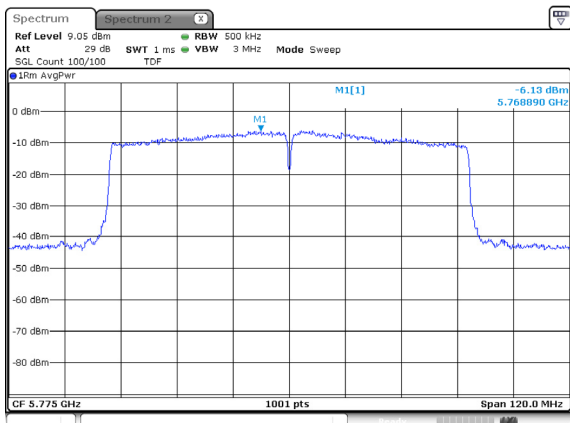
UNII-2C / 802.11ac VHT80 / Low ch.



UNII-2C / 802.11ac VHT80 / High ch.



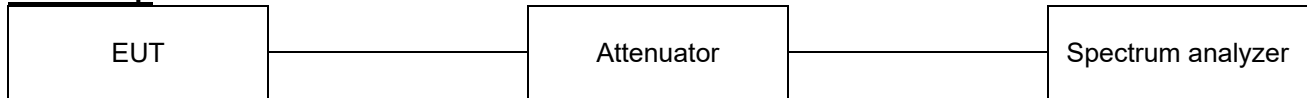
UNII-3 / 802.11ac VHT80 / Low ch.



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7.3. 26 dB Bandwidth & 99% Bandwidth

Test setup



Limit

N/A

Test procedure

ANSI C63.10-2013 Section 12.4

KDB 789033 D02 v02r01 - Section C.1 (26dBbandwidth)

KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. 99% Occupied Bandwidth

- Set center frequency to the nominal EUT channel center frequency.
- Set span = 1.5 times to 5.0 times the OBW.
- Set RBW = 1% to 5% of the OBW
- Set VBW $\geq 3 \times$ RBW
- Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- Use the 99% power bandwidth function of the instrument (if available).
- If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

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KCTL**Test results****26 dB bandwidth**

Test mode	Band	Frequency(MHz)	Measured Bandwidth (MHz)
802.11a	UNII-1	5 180	22.23
		5 200	20.08
		5 240	19.93
	UNII-2A	5 260	20.83
		5 280	21.18
		5 320	20.03
	UNII-2C	5 500	23.28
		5 600	21.28
		5 700	19.98
802.11n HT20	UNII-1	5 180	22.13
		5 200	20.18
		5 240	20.08
	UNII-2A	5 260	20.08
		5 280	20.28
		5 320	20.18
	UNII-2C	5 500	20.08
		5 600	20.28
		5 700	20.28
802.11n HT40	UNII-1	5 190	41.06
		5 230	41.16
	UNII-2A	5 270	41.06
		5 310	41.06
	UNII-2C	5 510	41.06
		5 590	40.76
802.11ac VHT80	UNII-1	5 210	81.28
	UNII-2A	5 290	81.52
	UNII-2C	5 530	81.76
		5 610	81.52

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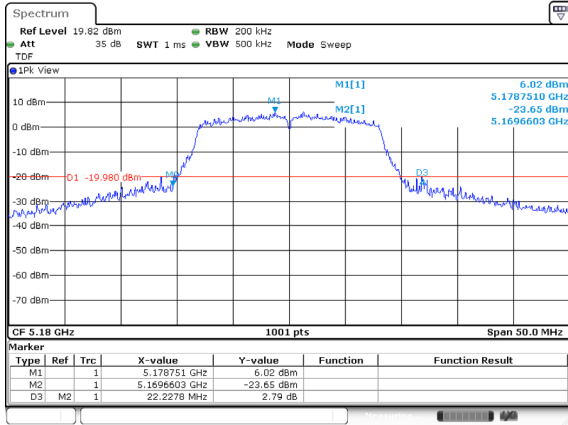
**99% bandwidth**

Test mode	Band	Frequency(MHz)	Measured Bandwidth (MHz)
802.11a	UNII-1	5 240	16.53
	UNII-2A	5 260	16.48
802.11n HT20	UNII-1	5 240	17.63
	UNII-2A	5 260	17.63
802.11n HT40	UNII-1	5 230	36.36
	UNII-2A	5 270	36.36
802.11ac VHT80	UNII-1	5 210	75.16
	UNII-2A	5 290	75.40

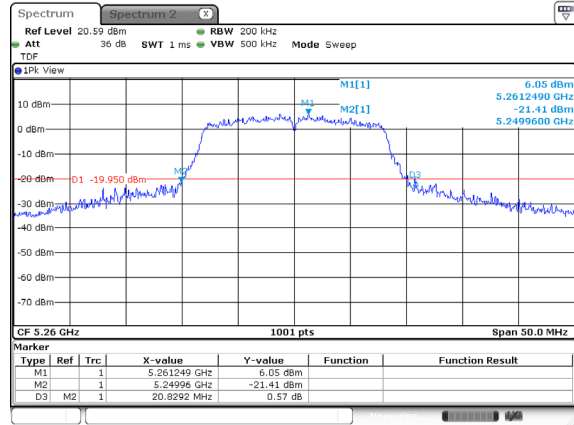


26 dB bandwidth

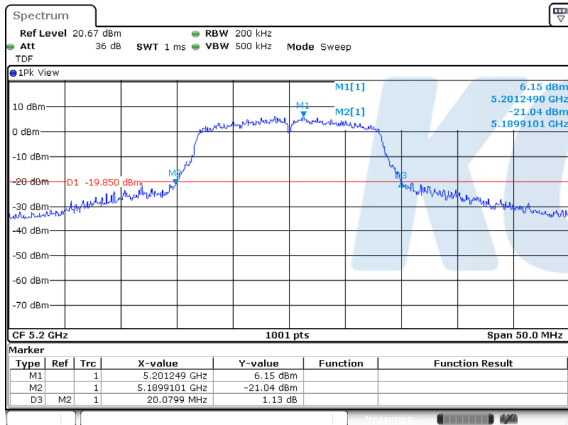
UNII-1 / 802.11a / Low ch.



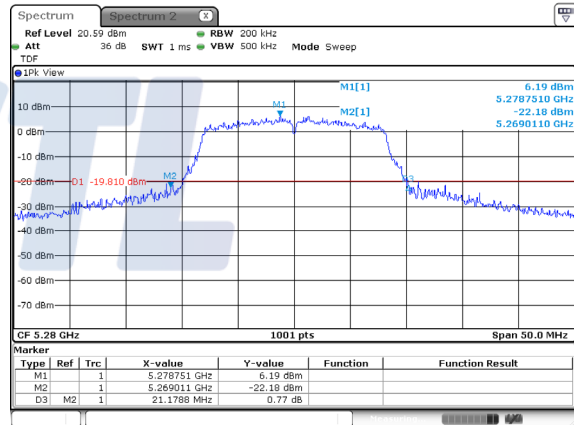
UNII-2A / 802.11a / Low ch.



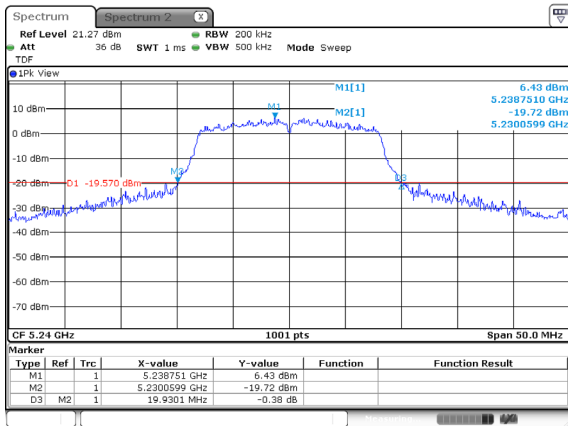
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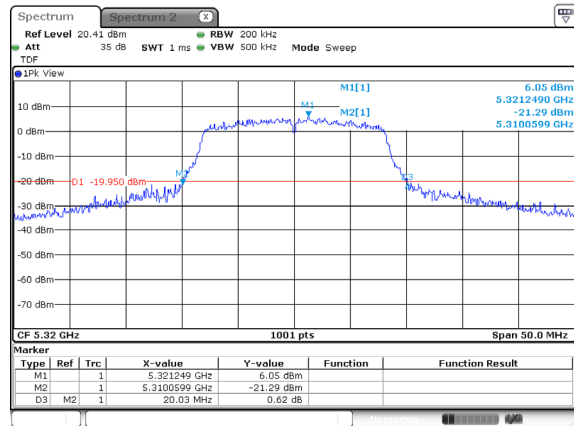
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UNII-1 / 802.11a / High ch.



UNII-2A / 802.11a / High ch.



KCTL Inc.

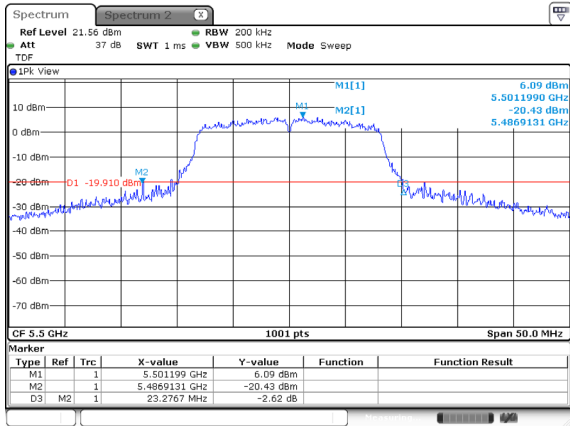
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR20-SRF0112-A

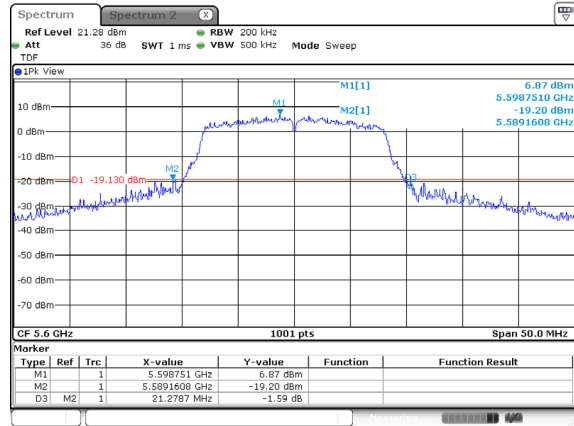
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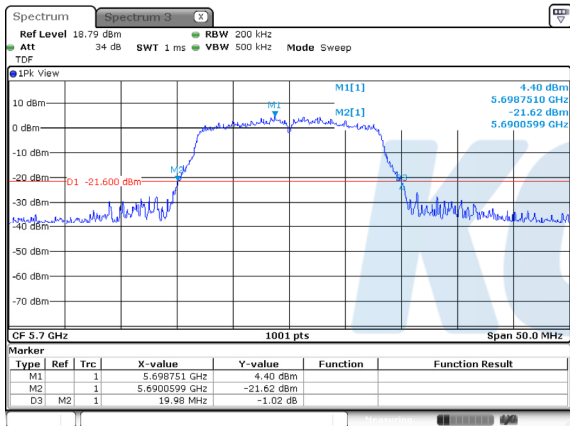
UNII-2C / 802.11a / Low ch.



UNII-2C / 802.11a / Mid ch.



UNII-2C / 802.11a / High ch.



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