

# KCTL Inc.

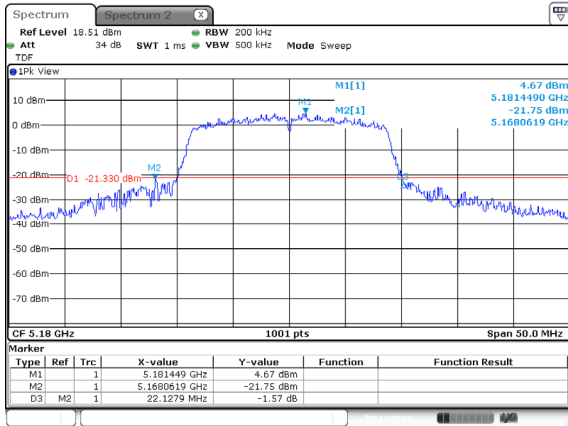
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Suwon-si, Gyeonggi-do, 16677, Korea  
TEL: 82-31-285-0894 FAX: 82-505-299-8311  
[www.kctl.co.kr](http://www.kctl.co.kr)

Report No.:  
KR20-SRF0112-A

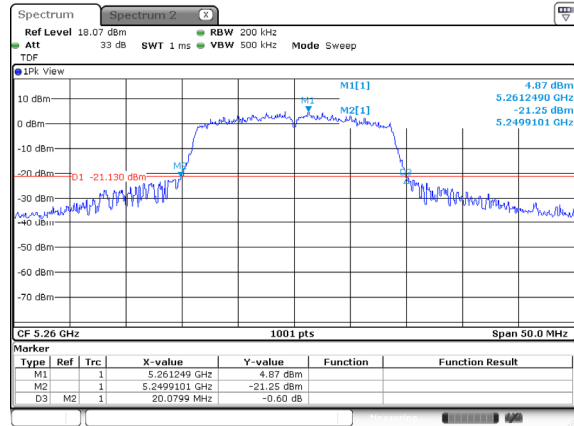
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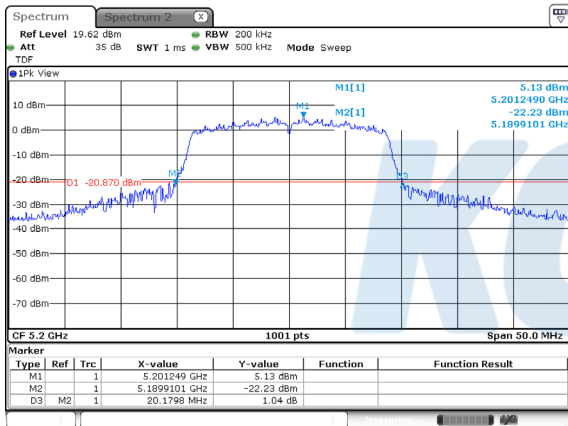
## UNII-1 / 802.11n HT20 / Low ch.



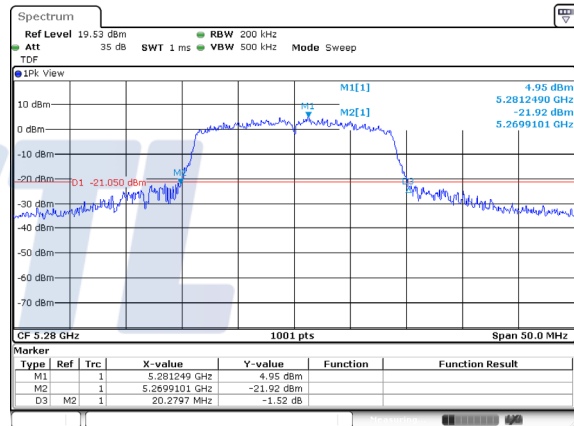
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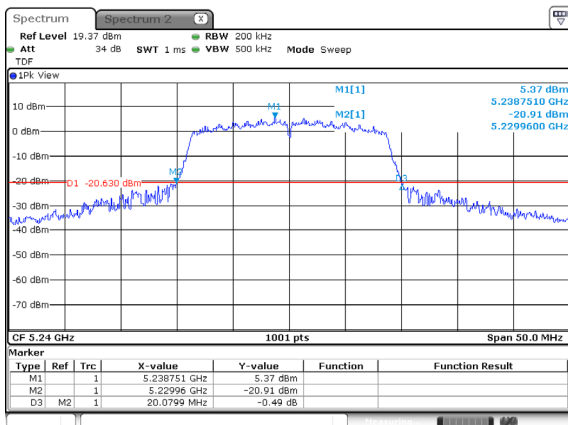
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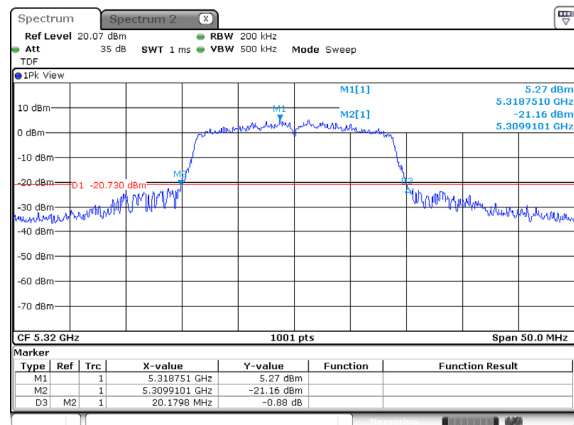
## UNII-2A / 802.11n HT20 / Mid ch.



## UNII-1 / 802.11n HT20 / High ch.



## UNII-2A / 802.11n HT20 / High ch.



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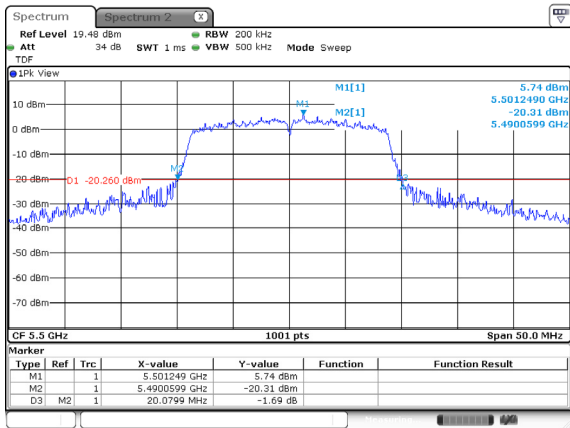
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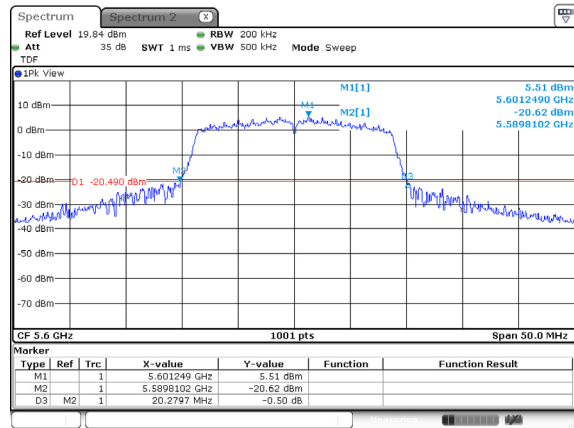
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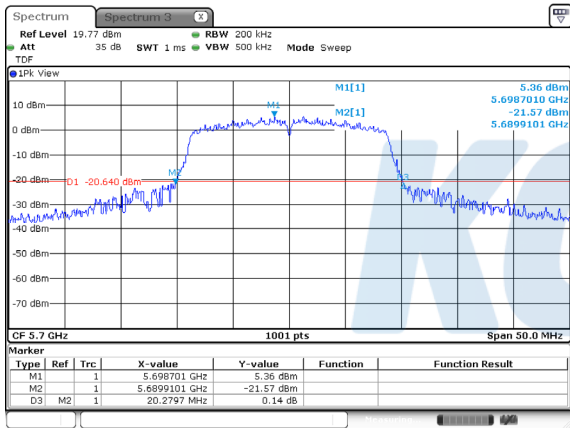
## UNII-2C / 802.11n HT20 / Low ch.



## UNII-2C / 802.11n HT20 / Mid ch.



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



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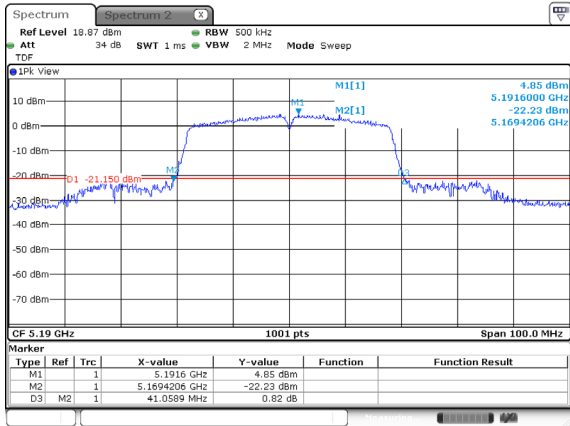
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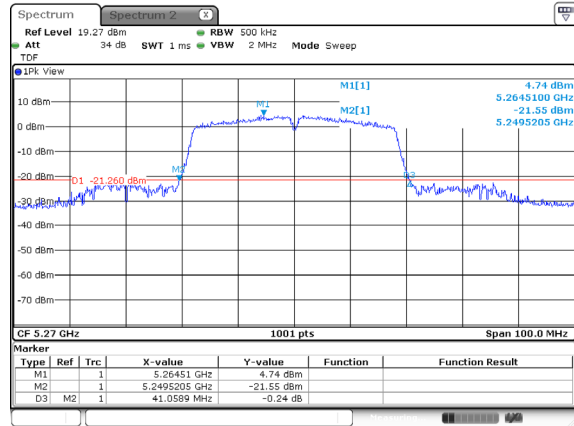
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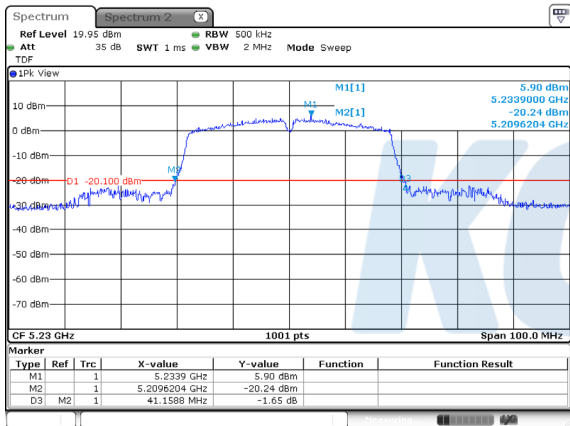
## UNII-1 / 802.11n HT40 / Low ch.



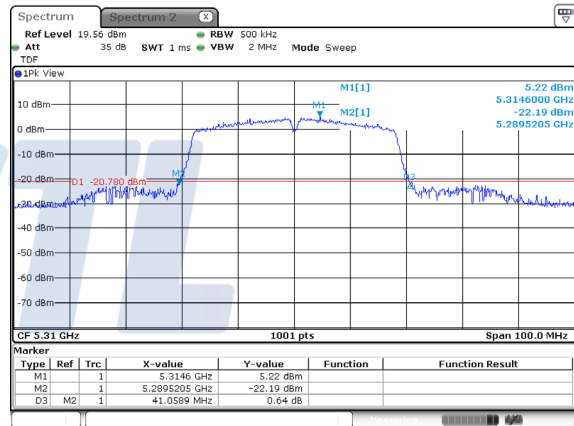
## UNII-2A / 802.11n HT40 / Low ch.



## UNII-1 / 802.11n HT40 / High ch.



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



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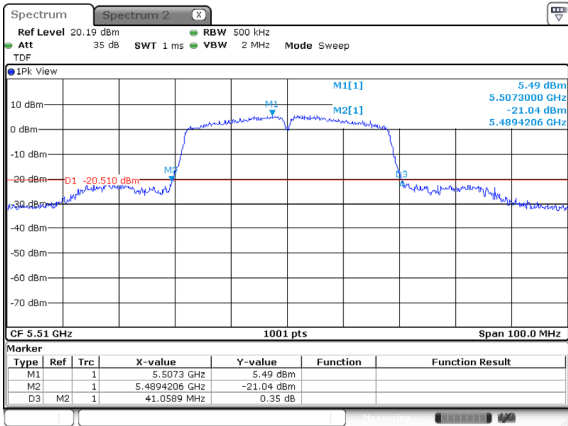
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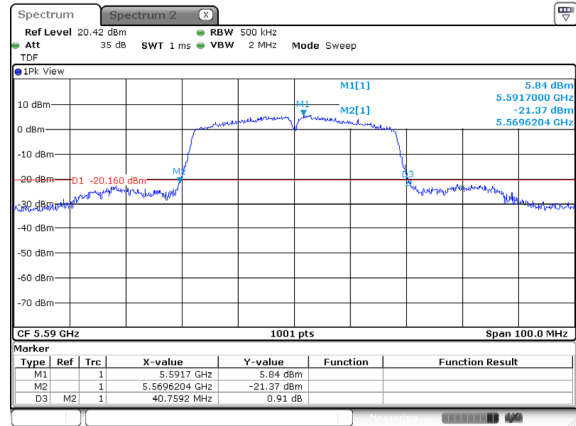
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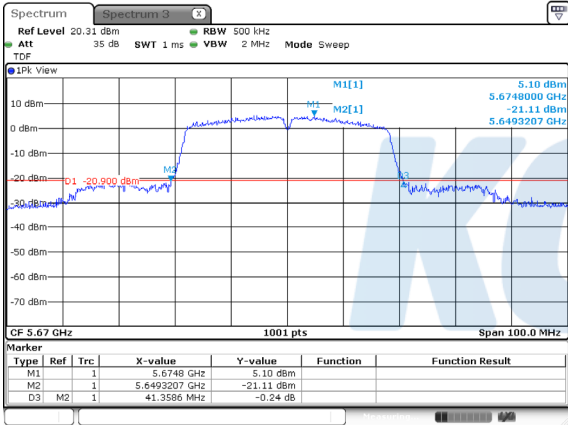
## UNII-2C / 802.11n HT40 / Low ch.



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



## UNII-2C / 802.11n HT40 / High ch.



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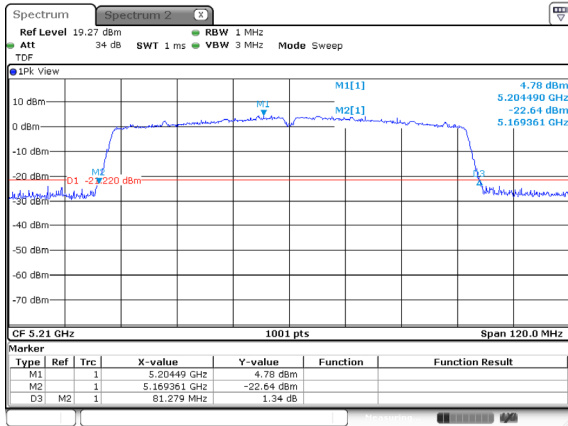
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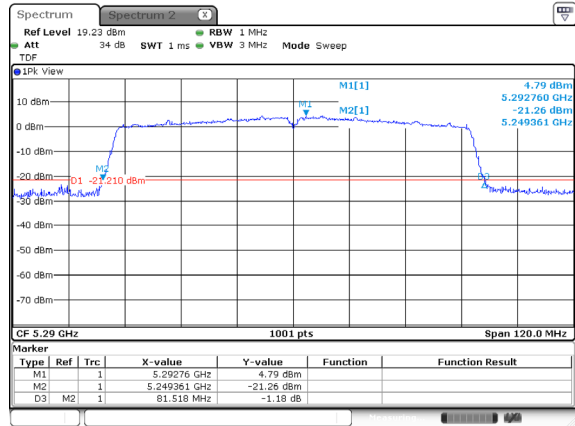
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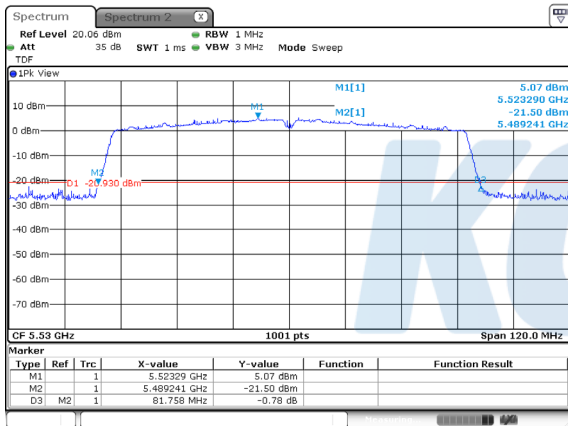
## UNII-1 / 802.11ac VHT80 / Low ch.



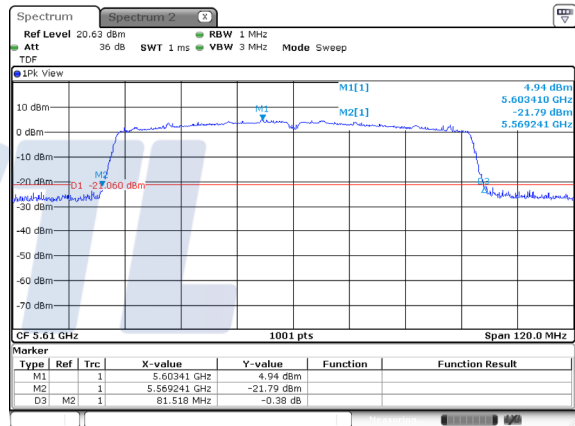
## UNII-2A / 802.11ac VHT80 / Low ch.



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



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



# KCTL Inc.

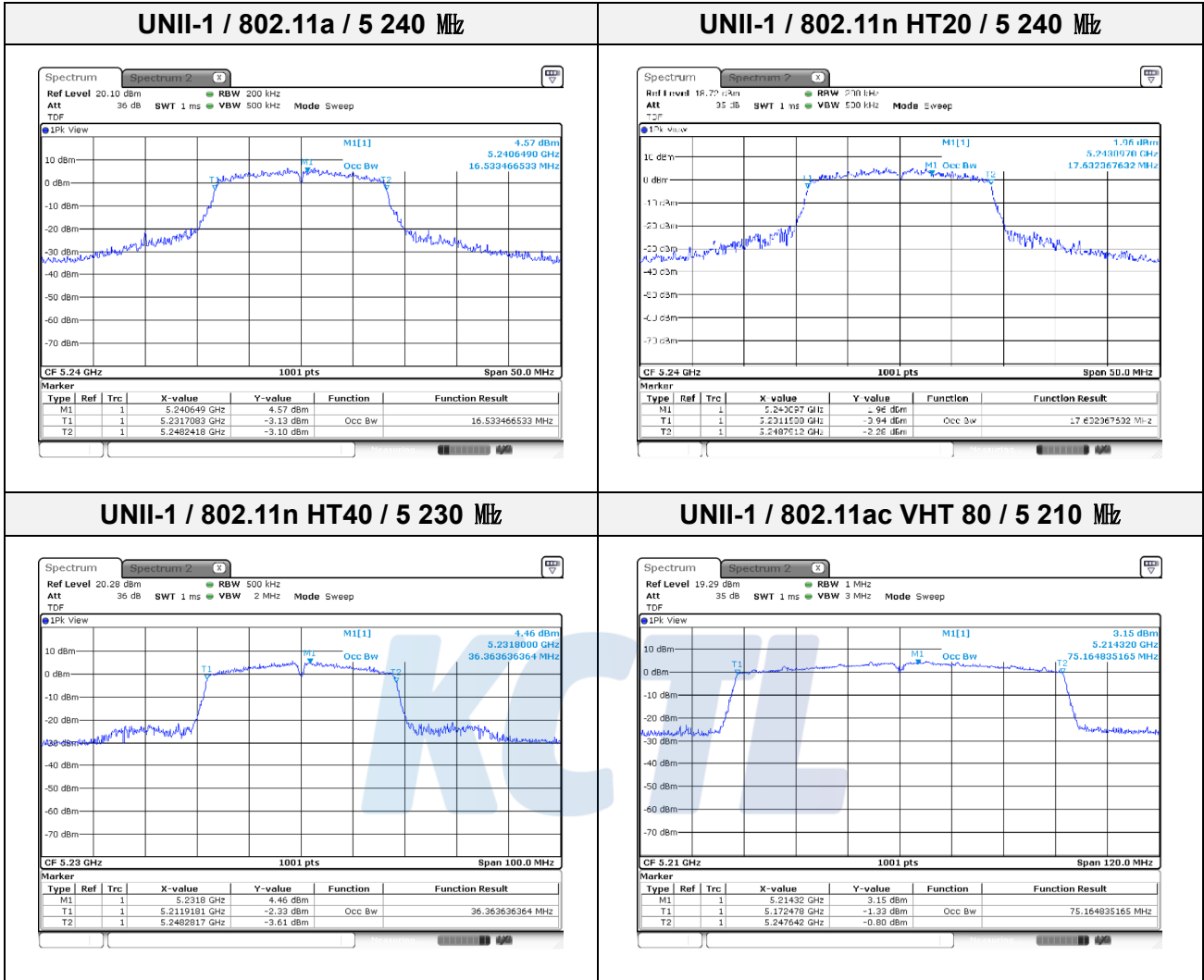
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## 99% bandwidth



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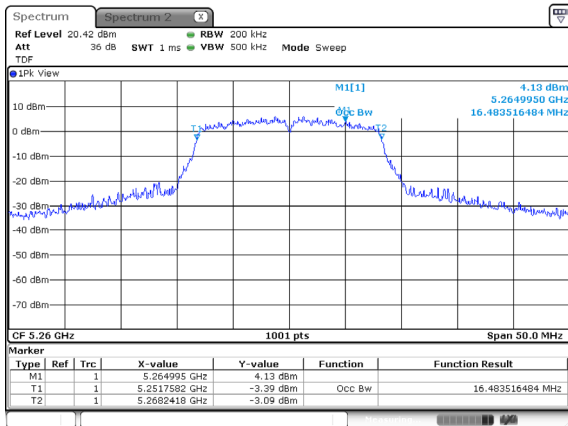
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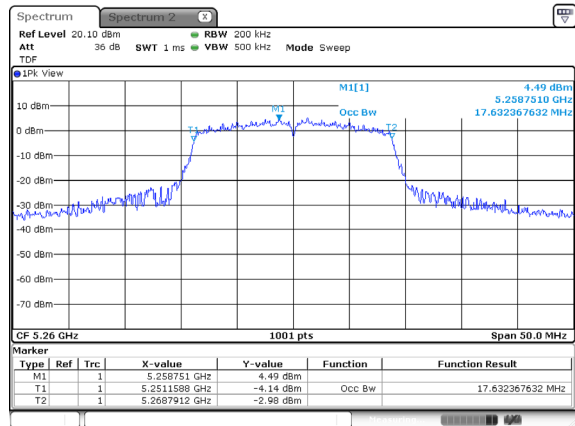
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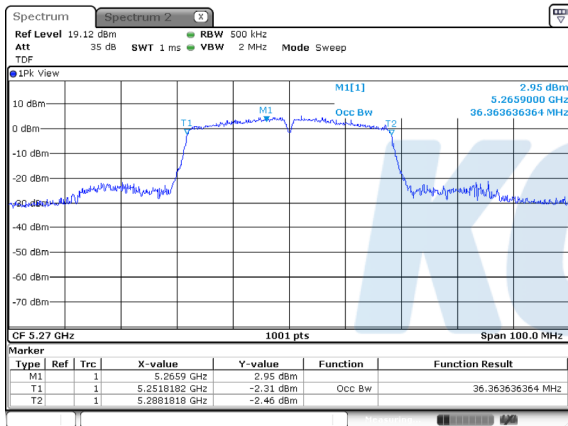
## UNII-2A / 802.11a / 5 260 MHz



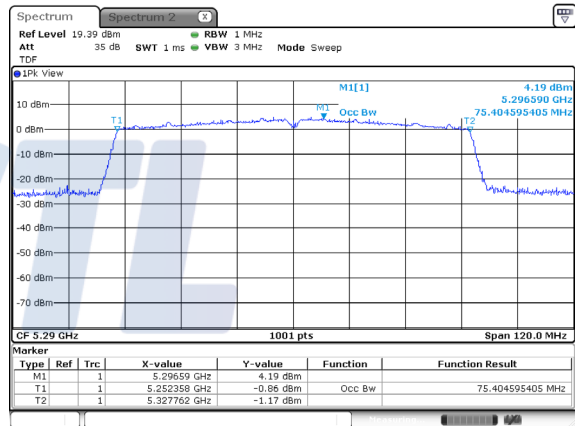
## UNII-2A / 802.11n HT20 / 5 260 MHz



## UNII-2A / 802.11n HT40 / 5 270 MHz

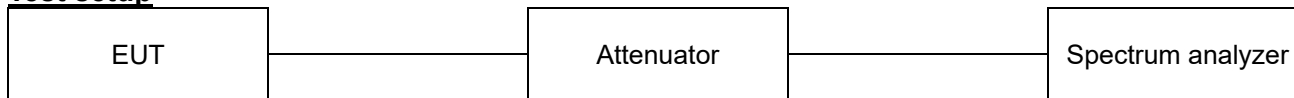


## UNII-2A / 802.11ac VHT 80 / 5 290 MHz



## 7.4. 6 dB Bandwidth

### Test setup



### Limit

According to §15.407(e), RSS-247(6.2.4)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth if U-NII devices shall be at least 500kHz

### Test procedure

ANSI C63.10-2013 Section 6.9.2

KDB 789033 D02 v02r01 - Section C.2

### Test settings

Minimum Emission Bandwidth for the band 5.725–5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725–5.85 GHz. The following procedure shall be used for measuring this bandwidth:

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



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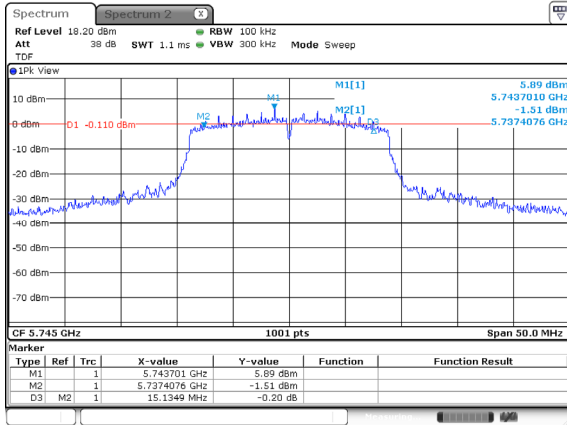
**Test results**

Test mode	Band	Frequency (MHz)	Measured Bandwidth (MHz)	Limit (MHz)
802.11a	UNII-3	5 745	15.13	0.50
		5 785	16.23	0.50
		5 825	15.18	0.50
802.11n HT20	UNII-3	5 745	15.18	0.50
		5 785	15.18	0.50
		5 825	15.18	0.50
802.11n HT40	UNII-3	5 755	35.26	0.50
		5 795	35.26	0.50
802.11ac VHT80	UNII-3	5 775	75.29	0.50

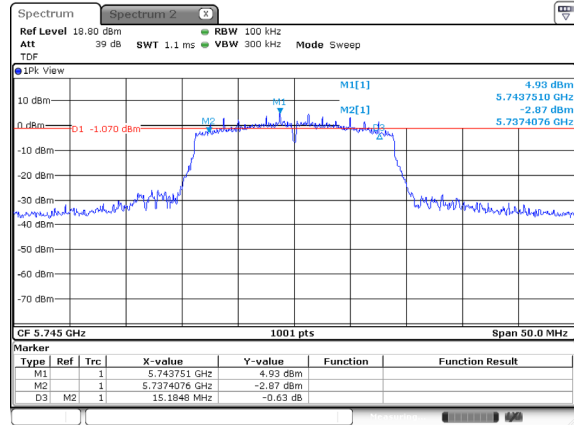


**6 dB bandwidth**

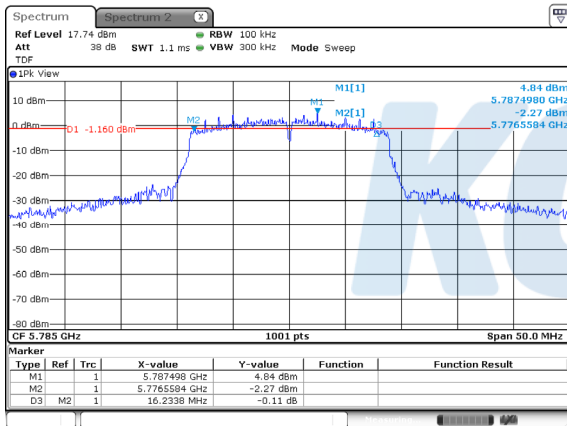
**UNII-3 / 802.11a / Low ch.**



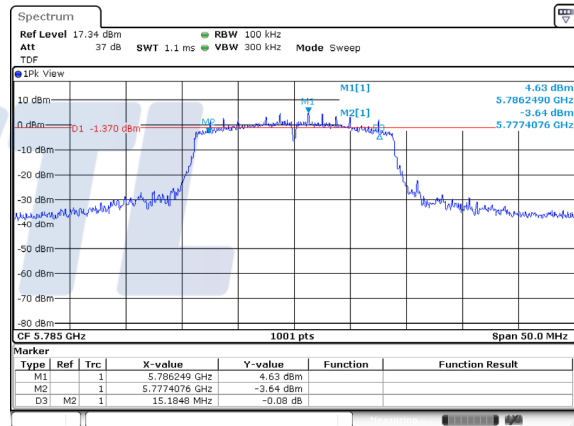
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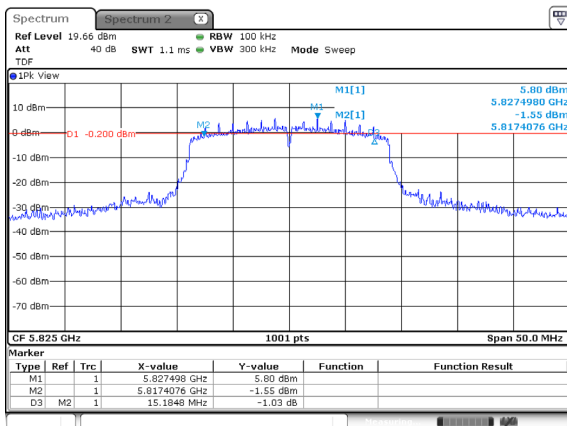
**UNII-3 / 802.11a / Mid ch.**



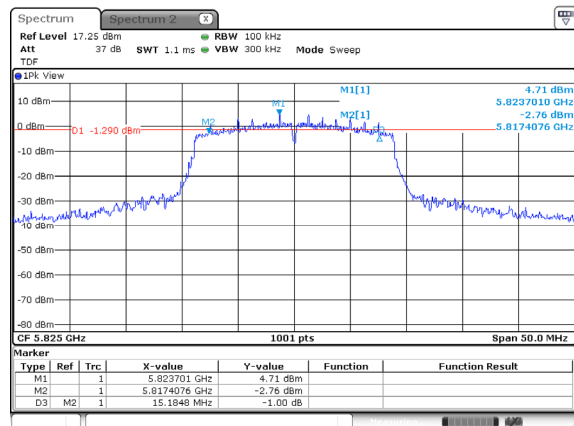
**UNII-3 / 802.11n HT20 / Mid ch.**



**UNII-3 / 802.11a / High ch.**



**UNII-3 / 802.11n HT20 / High ch.**



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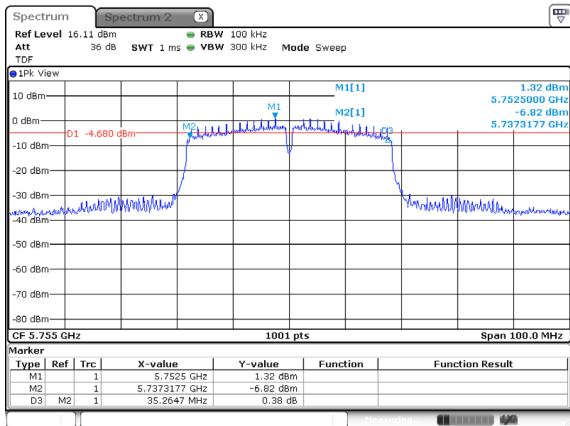
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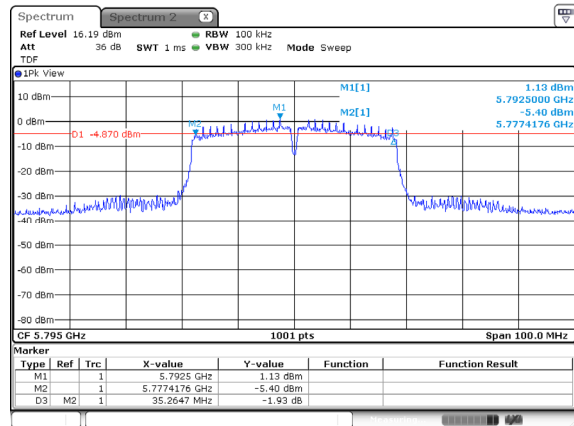
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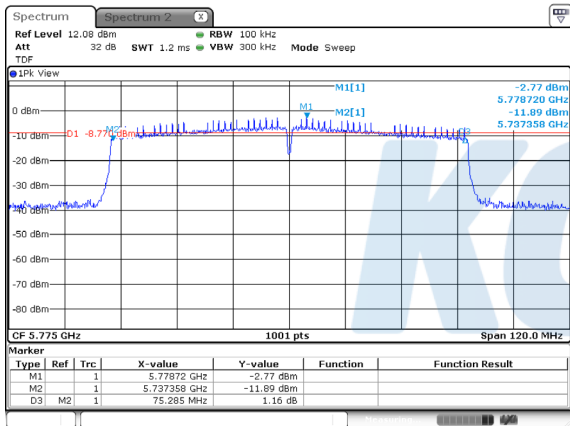
## UNII-3 / 802.11n HT40 / Low ch.



## UNII-3 / 802.11n HT40 / High ch.



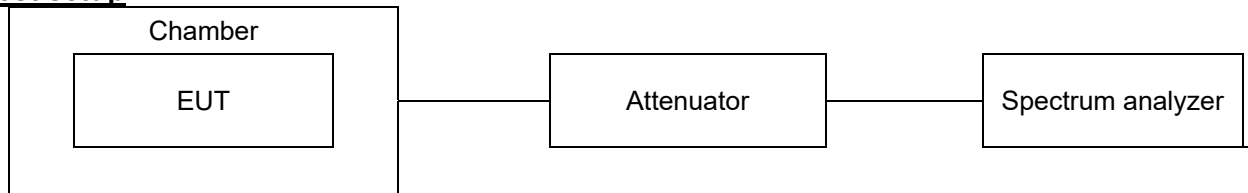
## UNII-3 / 802.11ac VHT80 / Low ch.



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## 7.5. Frequency Stability

### Test setup



### Limit

N/A

### Test procedure

ANSI C63.10-2013, clause 6.8.1

### Test settings

The frequency stability of the carrier frequency of the intentional radiator shall be maintained all conditions of normal operation as specified in the user manual. The frequency stability shall be maintained over a temperature variation of specified in the user manual at normal supply voltage, and over a variation in the primary supply voltage of specified in the user manual of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

1. The EUT was placed inside the environmental test chamber.
2. The temperature was incremented by 10 °C intervals from lowest temperature.
3. Each increase step of temperature measured the frequency.
4. The test temperature was set 20°C and the supply voltage was then adjusted on the EUT from 85 % to 115% and the frequency record.
5. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

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**Test results**

Test mode : UNII-1

Frequency(Hz) : 5 180 000 000

Voltage [%]	Voltage [V]	TEMP [°C]	Maintaining time	Measure frequency [Hz]	Frequency deviation [Hz]	Deviation [%]
100	3.85	+22(Ref)	Startup	5 179 993 198	-6 802	-0.000 13
			2 minutes	5 179 991 679	-8 321	-0.000 16
			5 minutes	5 179 990 738	-9 262	-0.000 18
			10 minutes	5 179 990 304	-9 696	-0.000 19
		-30	Startup	5 180 019 030	19 030	0.000 37
			2 minutes	5 180 017 077	17 077	0.000 33
			5 minutes	5 180 014 616	14 616	0.000 28
			10 minutes	5 180 011 360	11 360	0.000 22
		-20	Startup	5 180 020 695	20 695	0.000 40
			2 minutes	5 180 019 175	19 175	0.000 37
			5 minutes	5 180 018 090	18 090	0.000 35
			10 minutes	5 180 013 893	13 893	0.000 27
		-10	Startup	5 180 019 680	19 680	0.000 38
			2 minutes	5 180 020 120	20 120	0.000 39
			5 minutes	5 180 019 250	19 250	0.000 37
			10 minutes	5 180 019 103	19 103	0.000 37
		0	Startup	5 180 018 360	18 360	0.000 35
			2 minutes	5 180 017 695	17 695	0.000 34
			5 minutes	5 180 017 616	17 616	0.000 34
			10 minutes	5 180 017 819	17 819	0.000 34
		10	Startup	5 180 016 136	16 136	0.000 31
			2 minutes	5 180 015 991	15 991	0.000 31
			5 minutes	5 180 015 919	15 919	0.000 31
			10 minutes	5 180 015 557	15 557	0.000 30
		20	Startup	5 179 994 742	-5 258	-0.000 10
			2 minutes	5 179 994 864	-5 136	-0.000 10
			5 minutes	5 179 995 472	-4 528	-0.000 09
			10 minutes	5 179 996 262	-3 738	-0.000 07
		30	Startup	5 179 991 679	-8 321	-0.000 16
			2 minutes	5 179 991 317	-8 683	-0.000 17
			5 minutes	5 179 991 027	-8 973	-0.000 17
			10 minutes	5 179 990 087	-9 913	-0.000 19
40	Startup	5 179 981 357	-18 643	-0.000 36		
	2 minutes	5 179 980 923	-19 077	-0.000 37		
	5 minutes	5 179 979 794	-20 206	-0.000 39		
	10 minutes	5 179 978 694	-21 306	-0.000 41		
50	Startup	5 179 972 793	-27 207	-0.000 53		
	2 minutes	5 179 972 677	-27 323	-0.000 53		
	5 minutes	5 179 972 533	-27 467	-0.000 53		
	10 minutes	5 179 972 182	-27 818	-0.000 54		
85	3.27	+22(Ref)	Startup	5 179 984 226	-15 774	-0.000 30
			2 minutes	5 179 984 298	-15 702	-0.000 30
			5 minutes	5 179 984 732	-15 268	-0.000 29
			10 minutes	5 179 985 166	-14 834	-0.000 29
115	4.43	+22(Ref)	Startup	5 179 984 298	-15 702	-0.000 30
			2 minutes	5 179 982 996	-17 004	-0.000 33
			5 minutes	5 179 982 923	-17 077	-0.000 33
			10 minutes	5 179 982 779	-17 221	-0.000 33

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Test mode : UNII-2A

Frequency(Hz) : 5 260 000 000

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation		
[%]	[V]	[°C]		[Hz]	[Hz]	[%]		
100	3.85	+22(Ref)	Startup	5 259 987 337	-12 663	-0.000 24		
			2 minutes	5 259 986 035	-13 965	-0.000 27		
			5 minutes	5 259 985 601	-14 399	-0.000 27		
			10 minutes	5 259 985 456	-14 544	-0.000 28		
		-30	Startup	5 260 009 479	9 479	0.000 18		
			2 minutes	5 260 005 933	5 933	0.000 11		
			5 minutes	5 260 002 243	2 243	0.000 04		
			10 minutes	5 259 995 731	-4 269	-0.000 08		
		-20	Startup	5 260 017 945	17 945	0.000 34		
			2 minutes	5 260 017 366	17 366	0.000 33		
			5 minutes	5 260 015 702	15 702	0.000 30		
			10 minutes	5 260 014 544	14 544	0.000 28		
		-10	Startup	5 260 020 333	20 333	0.000 39		
			2 minutes	5 260 020 912	20 912	0.000 40		
			5 minutes	5 260 020 622	20 622	0.000 39		
			10 minutes	5 260 020 695	20 695	0.000 39		
		0	Startup	5 260 018 996	18 996	0.000 36		
			2 minutes	5 260 018 923	18 923	0.000 36		
			5 minutes	5 260 018 544	18 544	0.000 35		
			10 minutes	5 260 018 431	18 431	0.000 35		
		10	Startup	5 260 015 991	15 991	0.000 30		
			2 minutes	5 260 015 750	15 750	0.000 30		
			5 minutes	5 260 015 667	15 667	0.000 30		
			10 minutes	5 260 016 570	16 570	0.000 32		
		20	Startup	5 259 993 466	-6 534	-0.000 12		
			2 minutes	5 259 993 679	-6 321	-0.000 12		
			5 minutes	5 259 994 195	-5 805	-0.000 11		
			10 minutes	5 259 995 593	-4 407	-0.000 08		
		30	Startup	5 259 987 916	-12 084	-0.000 23		
			2 minutes	5 259 987 844	-12 156	-0.000 23		
			5 minutes	5 259 987 554	-12 446	-0.000 24		
			10 minutes	5 259 986 831	-13 169	-0.000 25		
		40	Startup	5 259 979 825	-20 175	-0.000 38		
			2 minutes	5 259 979 739	-20 261	-0.000 39		
			5 minutes	5 259 979 623	-20 377	-0.000 39		
			10 minutes	5 259 978 841	-21 159	-0.000 40		
		50	Startup	5 259 971 200	-28 800	-0.000 55		
			2 minutes	5 259 971 258	-28 742	-0.000 55		
			5 minutes	5 259 971 287	-28 713	-0.000 55		
			10 minutes	5 259 971 316	-28 684	-0.000 55		
		85	3.27	+22(Ref)	Startup	5 259 992 272	-7 728	-0.000 15
					2 minutes	5 259 991 983	-8 017	-0.000 15
					5 minutes	5 259 990 883	-9 117	-0.000 17
					10 minutes	5 259 990 767	-9 233	-0.000 18
		115	4.43	+22(Ref)	Startup	5 259 982 562	-17 438	-0.000 33
					2 minutes	5 259 982 344	-17 656	-0.000 34
					5 minutes	5 259 982 127	-17 873	-0.000 34
					10 minutes	5 259 981 983	-18 017	-0.000 34

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Test mode : UNII-2C

Frequency(Hz) : 5 500 000 000

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[°C]		[Hz]	[Hz]	[%]
100	3.85	+22(Ref)	Startup	5 499 984 370	-15 630	-0.000 28
			2 minutes	5 499 984 298	-15 702	-0.000 29
			5 minutes	5 499 984 081	-15 919	-0.000 29
			10 minutes	5 499 984 081	-15 919	-0.000 29
		-30	Startup	5 500 010 058	10 058	0.000 18
			2 minutes	5 500 006 295	6 295	0.000 11
			5 minutes	5 500 002 243	2 243	0.000 04
			10 minutes	5 499 994 428	-5 572	-0.000 10
		-20	Startup	5 500 015 920	15 920	0.000 29
			2 minutes	5 500 015 770	15 770	0.000 29
			5 minutes	5 500 015 340	15 340	0.000 28
			10 minutes	5 500 014 470	14 470	0.000 26
		-10	Startup	5 500 022 287	22 287	0.000 41
			2 minutes	5 500 022 576	22 576	0.000 41
			5 minutes	5 500 022 504	22 504	0.000 41
			10 minutes	5 500 022 431	22 431	0.000 41
		0	Startup	5 500 019 754	19 754	0.000 36
			2 minutes	5 500 019 736	19 736	0.000 36
			5 minutes	5 500 019 717	19 717	0.000 36
			10 minutes	5 500 019 358	19 358	0.000 35
		10	Startup	5 500 016 570	16 570	0.000 30
			2 minutes	5 500 016 498	16 498	0.000 30
			5 minutes	5 500 017 221	17 221	0.000 31
			10 minutes	5 500 017 294	17 294	0.000 31
		20	Startup	5 499 992 040	-7 960	-0.000 14
			2 minutes	5 499 992 223	-7 777	-0.000 14
			5 minutes	5 499 992 436	-7 564	-0.000 14
			10 minutes	5 499 992 554	-7 446	-0.000 14
		30	Startup	5 499 984 732	-15 268	-0.000 28
			2 minutes	5 499 984 588	-15 412	-0.000 28
			5 minutes	5 499 984 153	-15 847	-0.000 29
			10 minutes	5 499 983 213	-16 787	-0.000 31
		40	Startup	5 499 973 606	-26 394	-0.000 48
			2 minutes	5 499 973 217	-26 783	-0.000 49
			5 minutes	5 499 972 885	-27 115	-0.000 49
			10 minutes	5 499 972 582	-27 418	-0.000 50
		50	Startup	5 499 969 754	-30 246	-0.000 55
			2 minutes	5 499 969 740	-30 260	-0.000 55
			5 minutes	5 499 969 711	-30 289	-0.000 55
			10 minutes	5 499 969 682	-30 318	-0.000 55
85	3.27	+22(Ref)	Startup	5 499 989 015	-10 985	-0.000 20
			2 minutes	5 499 988 972	-11 028	-0.000 20
			5 minutes	5 499 988 914	-11 086	-0.000 20
			10 minutes	5 499 988 827	-11 173	-0.000 20
115	4.43	+22(Ref)	Startup	5 499 981 621	-18 379	-0.000 33
			2 minutes	5 499 981 331	-18 669	-0.000 34
			5 minutes	5 499 981 331	-18 669	-0.000 34
			10 minutes	5 499 981 259	-18 741	-0.000 34

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Test mode : UNII-3

Frequency(Hz) : 5 745 000 000

Voltage	Voltage	TEMP	Maintaining time	Measure frequency	Frequency deviation	Deviation
[%]	[V]	[°C]		[Hz]	[Hz]	[%]
100	3.85	+22(Ref)	Startup	5 744 983 575	-16 425	-0.000 29
			2 minutes	5 744 983 213	-16 787	-0.000 29
			5 minutes	5 744 983 430	-16 570	-0.000 29
			10 minutes	5 744 983 213	-16 787	-0.000 29
		-30	Startup	5 744 996 671	-3 329	-0.000 06
			2 minutes	5 744 997 395	-2 605	-0.000 05
			5 minutes	5 744 994 863	-5 137	-0.000 09
			10 minutes	5 744 993 632	-6 368	-0.000 11
		-20	Startup	5 745 018 810	18 810	0.000 33
			2 minutes	5 745 019 100	19 100	0.000 33
			5 minutes	5 745 017 370	17 370	0.000 30
			10 minutes	5 745 015 770	15 770	0.000 27
		-10	Startup	5 745 024 168	24 168	0.000 42
			2 minutes	5 745 024 023	24 023	0.000 42
			5 minutes	5 745 023 806	23 806	0.000 41
			10 minutes	5 745 023 589	23 589	0.000 41
		0	Startup	5 745 018 863	18 863	0.000 33
			2 minutes	5 745 019 370	19 370	0.000 34
			5 minutes	5 745 018 804	18 804	0.000 33
			10 minutes	5 745 018 546	18 546	0.000 32
		10	Startup	5 745 016 136	16 136	0.000 28
			2 minutes	5 745 015 991	15 991	0.000 28
			5 minutes	5 745 016 281	16 281	0.000 28
			10 minutes	5 745 017 221	17 221	0.000 30
		20	Startup	5 744 990 766	-9 234	-0.000 16
			2 minutes	5 744 990 476	-9 524	-0.000 17
			5 minutes	5 744 989 896	-10 104	-0.000 18
			10 minutes	5 744 987 146	-12 854	-0.000 22
		30	Startup	5 744 973 512	-26 488	-0.000 46
			2 minutes	5 744 973 047	-26 953	-0.000 47
			5 minutes	5 744 972 756	-27 244	-0.000 47
			10 minutes	5 744 972 261	-27 739	-0.000 48
		40	Startup	5 744 970 952	-29 048	-0.000 51
			2 minutes	5 744 970 429	-29 571	-0.000 51
			5 minutes	5 744 969 993	-30 007	-0.000 52
			10 minutes	5 744 969 934	-30 066	-0.000 52
		50	Startup	5 744 968 162	-31 838	-0.000 55
			2 minutes	5 744 968 220	-31 780	-0.000 55
			5 minutes	5 744 968 249	-31 751	-0.000 55
			10 minutes	5 744 968 278	-31 722	-0.000 55
85	3.27	+22(Ref)	Startup	5 744 988 205	-11 795	-0.000 21
			2 minutes	5 744 988 205	-11 795	-0.000 21
			5 minutes	5 744 988 133	-11 867	-0.000 21
			10 minutes	5 744 987 844	-12 156	-0.000 21
115	4.43	+22(Ref)	Startup	5 744 981 548	-18 452	-0.000 32
			2 minutes	5 744 981 476	-18 524	-0.000 32
			5 minutes	5 744 981 259	-18 741	-0.000 33
			10 minutes	5 744 980 825	-19 175	-0.000 33

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**7.6. Straddle channel****26dB bandwidth**

Test mode	Band	Frequency (MHz)	26dB Bandwidth (MHz)
802.11a	UNII-2C	5 720	14.94
802.11n HT20			15.49
802.11a	UNII-3	5 720	5.01
802.11n HT20			5.26
802.11n HT40	UNII-2C	5 710	35.28
802.11n HT40	UNII-3	5 710	5.52
802.11ac VHT80	UNII-2C	5 690	75.88
	UNII-3	5 690	5.76

**Notes:**

1. [UNII-C] 26dB Bandwidth = 5 725MHz – Measured Frequency[MHz]
2. [UNII-3] 26dB Bandwidth = Measured Frequency[MHz] – 5 725MHz

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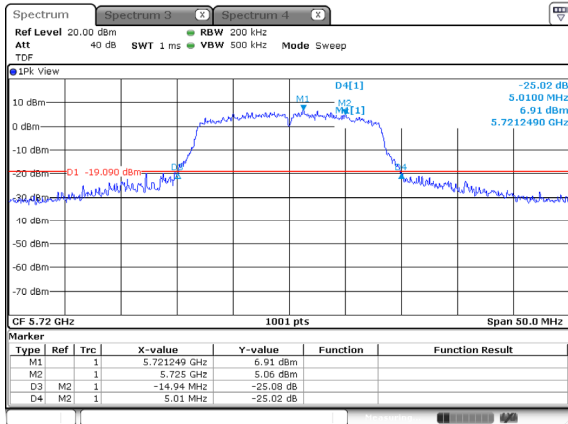
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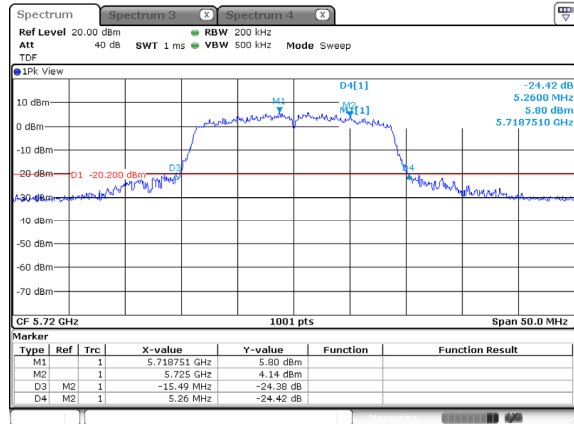
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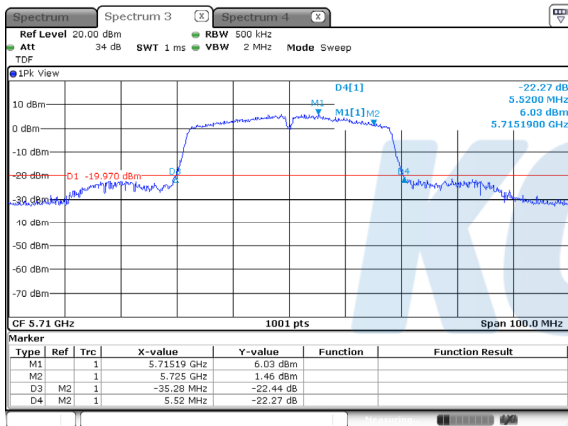
## 802. 11a



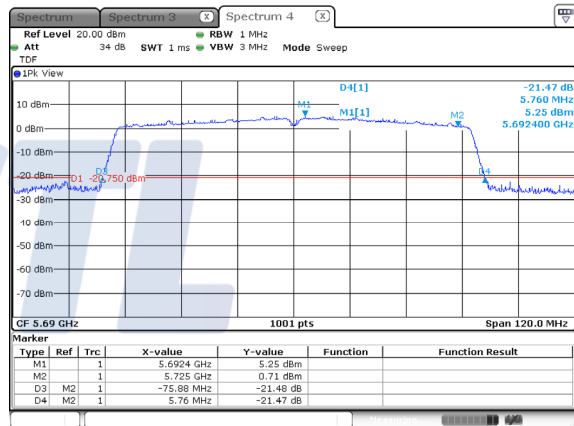
## 802. 11n HT20



## 802. 11n HT40



## 802. 11ac VHT80



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**6dB bandwidth**

Test mode	Band	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
802.11a	UNII-3	5 720	2.59	0.5
802.11n HT20			2.59	0.5
802.11n HT40	UNII-3	5 710	2.66	0.5
802.11ac VHT80	UNII-3	5 690	2.64	0.5

**Notes:**

1. 6dB Bandwidth = Measured Frequency[MHz] – 5 725MHz



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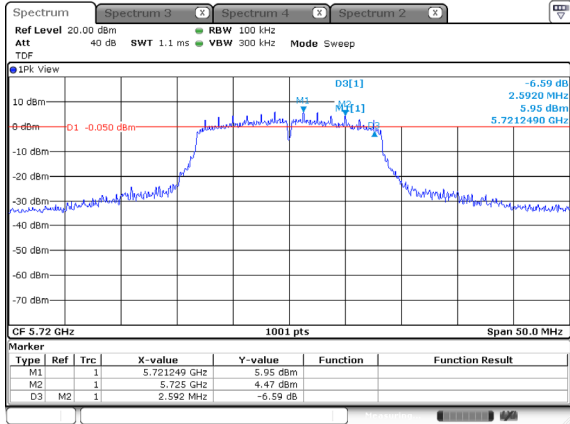
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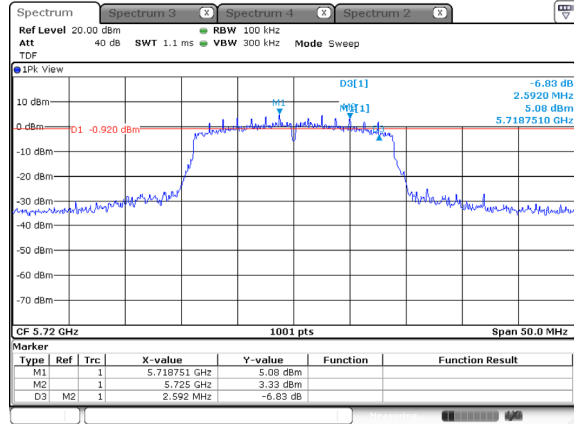
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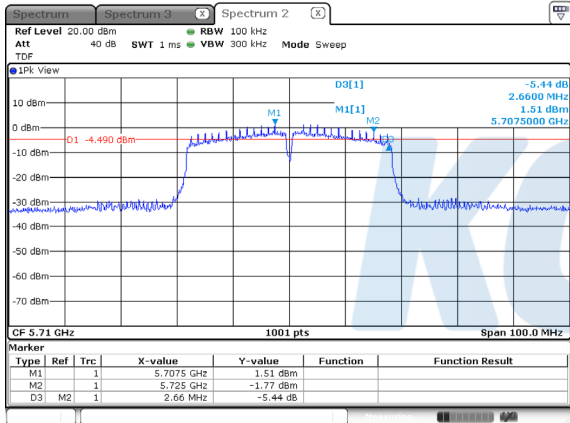
## 802. 11a



## 802. 11n HT20



## 802. 11n HT40



## 802. 11ac VHT80



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**KCTL****Output Power**

Test mode	Band	Frequency (MHz)	Measured power (dBm)	DCF (dB)	Conducted output power (dBm)	Conducted Power Limit (dBm)
					Average	
802.11a	UNII-2C	5 720	12.91	0.14	13.05	22.74
802.11n HT20			12.53	0.15	12.68	22.90
802.11a	UNII-3	5 720	5.24	0.14	5.38	30.00
802.11n HT20			5.27	0.15	5.42	30.00
802.11n HT40	UNII-2C	5 710	13.21	0.29	13.50	26.48
802.11n HT40	UNII-3	5 710	0.89	0.29	1.18	30.00
802.11ac VHT80	UNII-2C	5 690	12.04	0.57	12.61	29.80
	UNII-3	5 690	-3.76	0.57	-3.19	30.00

**Note:**

1. Conducted Output power Calculation:

Conducted Output power = Measured power(dB m) + DCF (dB)

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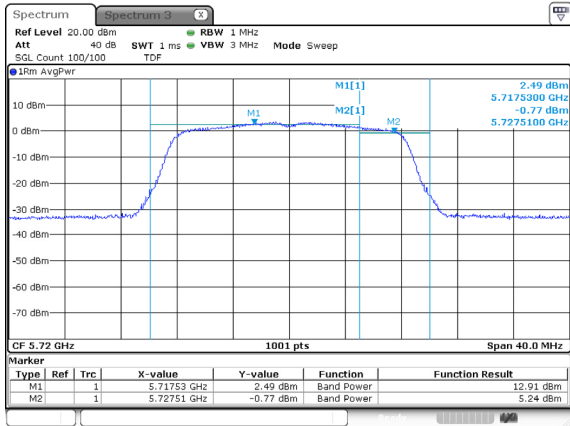
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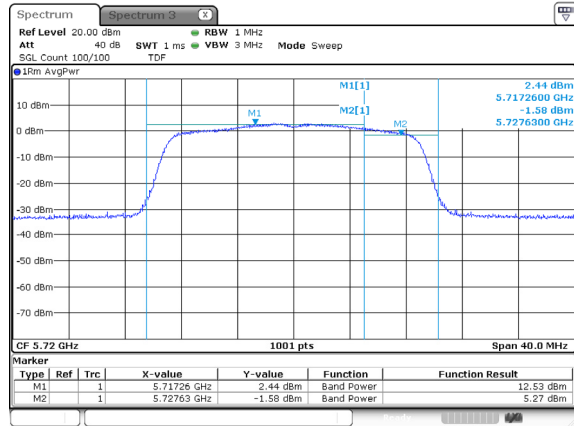
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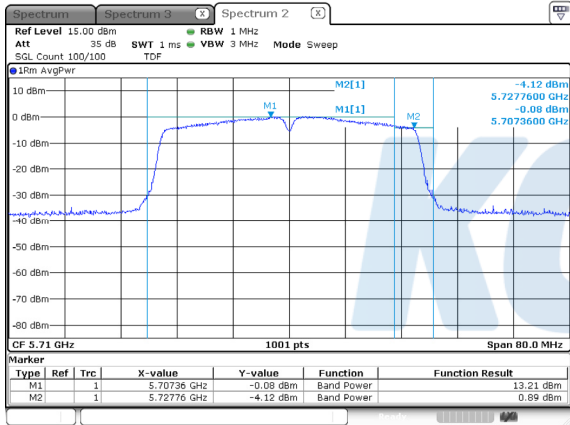
## 802. 11a .



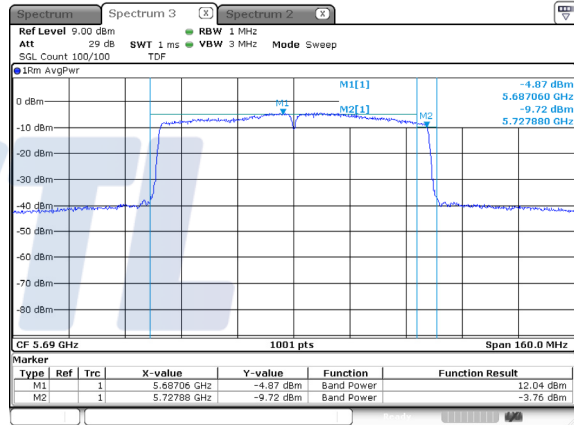
## 802. 11n HT20



## 802. 11n HT40



## 802. 11ac VHT80



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**Power Spectral Density**

Test mode	Band	Frequency (MHz)	Measured PSD (dB m/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dB m/MHz)
802.11a	UNII-2C	5 720	4.12	0.14	4.26	11.00
802.11n HT20			3.68	0.15	3.83	11.00
802.11a	UNII-3	5 720	-1.05	0.14	-0.91	30.00
802.11n HT20			-1.39	0.15	-1.24	30.00
802.11n HT40	UNII-2C	5 710	0.96	0.29	1.25	11.00
802.11n HT40	UNII-3	5 710	-5.47	0.29	-5.18	30.00
802.11ac VHT80	UNII-2C	5 690	-3.60	0.57	-3.03	11.00
	UNII-3	5 690	-10.45	0.57	-9.88	30.00



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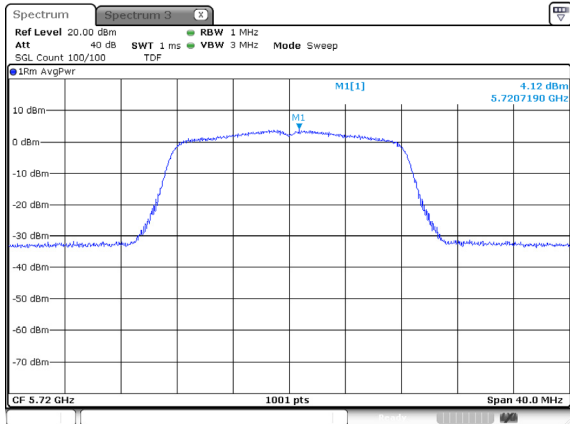
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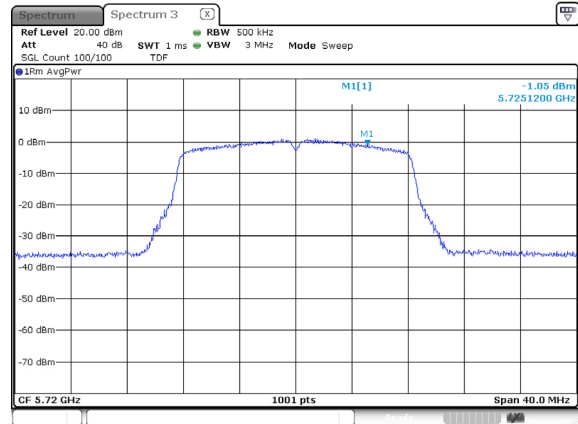
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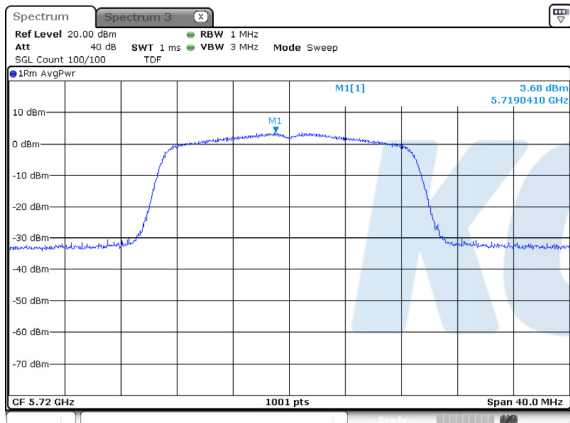
## UNII-2C / 802. 11a



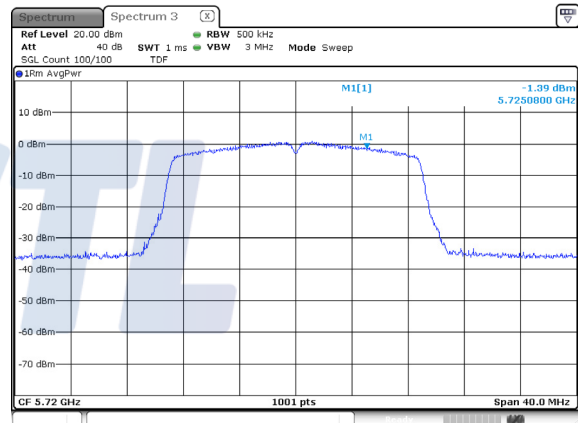
## UNII-3 / 802. 11a



## UNII-2C / 802. 11n HT20



## UNII-3 / 802. 11n HT20





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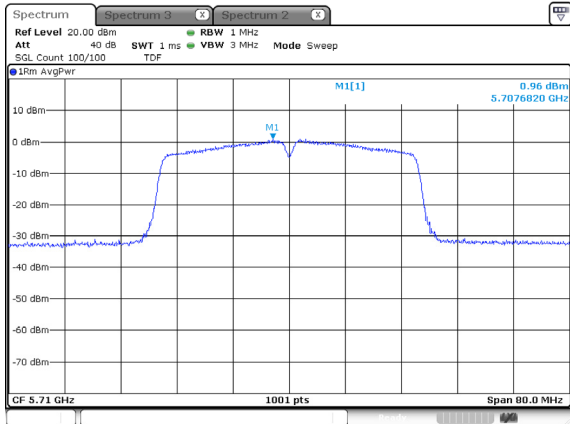
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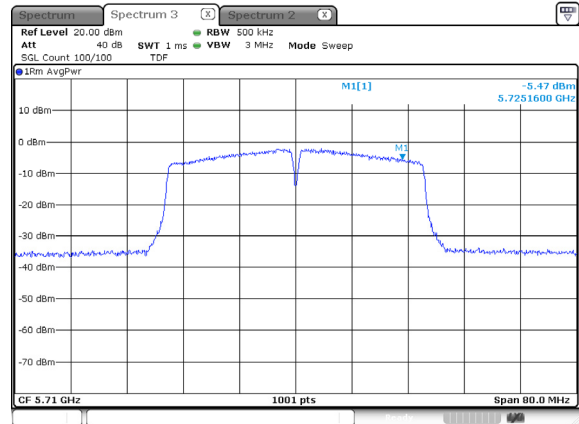
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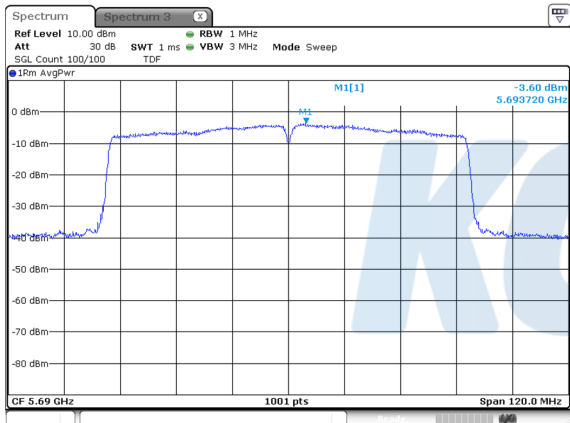
## UNII-2C / 802.11n HT40



## UNII-3 / 802.11n HT40



## UNII-2C / 802.11ac VHT80



## UNII-3 / 802.11ac VHT80

