10. Average Power

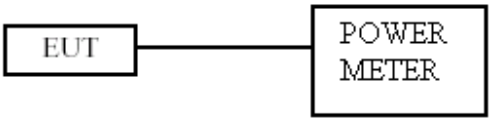
10.1. Test Limit

None; for reporting purposes only.

10.2. Test Procedure

The transmitter output is connected to a power meter.
The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

10.3. Test Setup Layout



10.4. Test Result and Data

Temperature: 23°C Humidity: 60%
Test Date: Sep. 19, 2017 Test Mode: 1TX

In the 5.2G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm) ANT A	Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
802.11a	36	5180	11.46	11.46	14.00	24.00
	44	5220	12.57	12.57	18.07	24.00
	48	5240	12.25	12.25	16.79	24.00
802.11an HT20	36	5180	12.27	12.27	16.87	24.00
	44	5220	11.89	11.89	15.45	24.00
	48	5240	11.83	11.83	15.24	24.00
802.11an HT40	38	5190	9.95	9.95	9.89	24.00
	46	5230	11.69	11.69	14.76	24.00

In the 5.3G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)	Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A			
802.11a	52	5260	11.48	11.48	14.06	24.00
	60	5300	11.52	11.52	14.19	24.00
	64	5320	12.36	12.36	17.22	24.00
802.11an HT20	52	5260	11.37	11.37	13.71	24.00
	60	5300	11.15	11.15	13.03	24.00
	64	5320	11.08	11.08	12.82	24.00
802.11an HT40	54	5270	12.37	12.37	17.26	24.00
	62	5310	10.00	10.00	10.00	24.00

In the 5.5G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)	Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A			
802.11a	100	5500	13.1	13.10	20.42	24.00
	116	5580	14.39	14.39	27.48	24.00
	140	5700	13.1	13.10	20.42	24.00
802.11an HT20	100	5500	12.41	12.41	17.42	24.00
	116	5580	12.75	12.75	18.84	24.00
	140	5700	12.42	12.42	17.46	24.00
802.11an HT40	102	5510	10.05	10.05	10.12	24.00
	110	5550	11.86	11.86	15.35	24.00
	134	5670	12.22	12.22	16.67	24.00

In the 5.8G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)	Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A			
802.11a	149	5745	14.32	14.32	27.04	30.00
	157	5785	14.4	14.40	27.54	30.00
	165	5825	13.98	13.98	25.00	30.00
802.11an HT20	149	5745	11.61	11.61	14.49	30.00
	157	5785	12.03	12.03	15.96	30.00
	165	5825	11.98	11.98	15.78	30.00
802.11an HT40	151	5755	11.59	11.59	14.42	30.00
	159	5795	12.02	12.02	15.92	30.00

Temperature: 23°C Humidity: 60%

Test Date: Sep. 19, 2017 Test Mode: 2TX

In the 5.2G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)		Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A	ANT B			
802.11a	36	5180	9.15	8.23	11.72	14.88	24.00
	44	5220	9.56	8.21	11.95	15.66	24.00
	48	5240	9.45	7.91	11.76	14.99	24.00
802.11an HT20	36	5180	8.97	7.92	11.49	14.08	24.00
	44	5220	9.41	8.04	11.79	15.10	24.00
	48	5240	8.97	7.51	11.31	13.52	24.00
802.11an HT40	38	5190	7.47	5.88	9.76	9.46	24.00
	46	5230	9.75	8.69	12.26	16.84	24.00

In the 5.3G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)		Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A	ANT B			
802.11a	52	5260	9.54	8.06	11.87	15.39	24.00
	60	5300	10.58	9.19	12.95	19.73	24.00
	64	5320	10.4	8.89	12.72	18.71	24.00
802.11an HT20	52	5260	8.91	7.54	11.29	13.46	24.00
	60	5300	8.79	7.52	11.21	13.22	24.00
	64	5320	8.64	7.49	11.11	11.00	24.00
802.11an HT40	54	5270	10.03	8.8	12.47	17.66	24.00
	62	5310	8.17	7.09	10.67	11.68	24.00

In the 5.5G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)		Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A	ANT B			
802.11a	100	5500	10.8	10.49	13.66	23.22	24.00
	116	5580	11.81	11.33	14.59	28.75	24.00
	140	5700	10.75	10.18	13.48	22.31	24.00
802.11an HT20	100	5500	10.14	9.96	13.06	20.24	24.00
	116	5580	10.02	9.86	12.95	19.73	24.00
	140	5700	10.07	9.86	12.98	19.85	24.00
802.11an HT40	102	5510	7.28	7.34	10.32	10.77	24.00
	110	5550	8.85	8.83	11.85	15.31	24.00
	134	5670	9.58	9.18	12.39	17.36	24.00

In the 5.8G Band

Modulation Type	Channel	Frequency (MHz)	Avg Power Output (dBm)		Total Power (dBm)	Total Power (mW)	Power Limit (dBm)
			ANT A	ANT B			
802.11a	149	5745	11.12	12.04	14.61	28.94	30.00
	157	5785	11.27	12.26	14.80	30.22	30.00
	165	5825	10.69	11.83	14.31	26.96	30.00
802.11an HT20	149	5745	8.65	9.56	12.14	16.36	30.00
	157	5785	8.74	9.78	12.30	16.99	30.00
	165	5825	9.02	10.12	12.62	18.26	30.00
802.11an HT40	151	5755	8.54	9.63	12.13	16.33	30.00
	159	5795	8.76	9.92	12.39	17.33	30.00

11. PPSD

11.1. Test Limit

Output Power:

Frequency Band			Limit
☒	5.15~5.25GHz		
	Operating Mode		
	☐	Outdoor access point	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) 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 30degrees as measured from the horizon must not exceed125 mW (21 dBm).
	☐	Indoor access point	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) 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.
	☐	Fixed point-to-point access points	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). 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.
	☒	Mobile and portable client devices	The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) 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.

Frequency Band		Limit
☒	5.25-5.35 GHz	The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. 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.
☒	5.470-5.725 GHz	
☒	5.725~5.85 GHz	The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

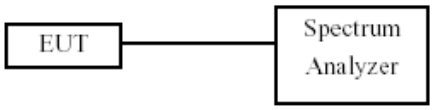
PSD:

Frequency Band			Limit
☒	5.15~5.25GHz		
	Operating Mode		
	☐	Outdoor access point	17 dBm/MHz
	☐	Indoor access point	17 dBm/MHz
	☐	Fixed point-to-point access points	17 dBm/MHz
	☒	Mobile and portable client devices	11 dBm/MHz
☒	5.725~5.85 GHz		11 dBm/MHz
☒	5.470-5.725 GHz		11 dBm/MHz
☒	5.725~5.85 GHz		30 dBm/500kHz

11.2.Test Procedure

As an alternative to FCC KDB-789033, the EUT maximum conducted output power was Measured with an average power meter employing a video bandwidth greater than 6dB BW of the emission under test. Maximum conducted output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of FCC KDB-789033, and provides more accurate measurements.
802.11an (BW≦40MHz) Maximum conducted output power using KDB 789033 section E)3)b) Method PM-G (Measurement using a gated RF average power meter)
Note: the power meter have a video bandwidth that is greater than or equal to the measurement bandwidth, (Anritsu/ MA2411B video bandwidth: 65MHz)
802.11ac (BW=80MHz) Maximum conducted output power using KDB 789033 section E)2)b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).
When transmitted signals consist of two or more non-contiguous spectrum segments (e.g., 80+80 MHz mode) or when a single spectrum segment of a transmission crosses the boundary between two adjacent U-NII bands, KDB 644545 D01 section F) procedure is used for measurements.

11.3.Test Setup Layout



11.4. Test Result and Data

Temperature: 23°C Humidity: 60%

Test Date: Sep. 19, 2017 Test Mode: 1TX

In the 5.2G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)	Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A				
802.11a	36	5180	0.66	0.66	0.16	0.82	11.00
	44	5220	1.37	1.37	0.16	1.53	11.00
	48	5240	1.49	1.49	0.16	1.65	11.00
802.11an HT20	36	5180	0.48	0.48	0.17	0.65	11.00
	44	5220	0.67	0.67	0.17	0.84	11.00
	48	5240	0.97	0.97	0.17	1.14	11.00
802.11an HT40	38	5190	-4.74	-4.74	0.34	-4.40	11.00
	46	5230	-3.36	-3.36	0.34	-3.02	11.00

In the 5.3G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)	Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A				
802.11a	52	5260	0.67	0.67	0.16	0.83	11.00
	60	5300	0.83	0.83	0.16	0.99	11.00
	64	5320	2.39	2.39	0.16	2.55	11.00
802.11an HT20	52	5260	0.44	0.44	0.17	0.61	11.00
	60	5300	0.62	0.62	0.17	0.79	11.00
	64	5320	0.38	0.38	0.17	0.55	11.00
802.11an HT40	54	5270	-2.28	-2.28	0.34	-1.94	11.00
	62	5310	-4.58	-4.58	0.34	-4.24	11.00

In the 5.5G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)	Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A				
802.11a	100	5500	3.75	3.75	0.16	3.91	11.00
	116	5580	4.62	4.62	0.16	4.78	11.00
	140	5700	2.70	2.70	0.16	2.86	11.00
802.11an HT20	100	5500	2.41	2.41	0.17	2.58	11.00
	116	5580	3.17	3.17	0.17	3.34	11.00
	140	5700	1.98	1.98	0.17	2.15	11.00
802.11an HT40	102	5510	-3.32	-3.32	0.34	-2.98	11.00
	118	5550	-1.97	-1.97	0.34	-1.63	11.00
	134	5670	-1.62	-1.62	0.34	-1.28	11.00

In the 5.8G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)	Sum chain (dBm)	Duty Cycle CF(dB)	10log(500KHz /RBW) CF (dB)	Total Corr'd PPSD (dBm/ 500kHz)	PPSD Limit (dBm/ 500kHz)
			ANT A					
802.11a	149	5745	3.83	3.83	0.16	-3.01	0.98	30.00
	157	5785	3.35	3.35	0.16	-3.01	0.50	30.00
	165	5825	2.34	2.34	0.16	-3.01	-0.51	30.00
802.11an HT20	149	5745	0.83	0.83	0.17	-3.01	-2.01	30.00
	157	5785	0.87	0.87	0.17	-3.01	-1.97	30.00
	165	5825	0.24	0.24	0.17	-3.01	-2.60	30.00
802.11an HT40	155	5755	-2.98	-2.98	0.34	-3.01	-5.65	30.00
	159	5795	-3.12	-3.12	0.34	-3.01	-5.79	30.00

Temperature: 23°C Humidity: 60%

Test Date: Sep. 19, 2017 Test Mode: 2TX

In the 5.2G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)		Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A	ANT B				
802.11a	36	5180	-1.33	-2.12	1.30	0.16	1.46	8.53
	44	5220	-1.44	-2.41	1.11	0.16	1.27	8.53
	48	5240	-1.62	-2.49	0.98	0.16	1.14	8.53
802.11an HT20	36	5180	-1.53	-2.13	1.19	0.17	1.36	8.53
	44	5220	-1.30	-2.39	1.20	0.17	1.37	8.53
	48	5240	-1.68	-2.52	0.93	0.17	1.10	8.53
802.11an HT40	38	5190	-7.33	-8.23	-4.75	0.34	-4.41	8.53
	46	5230	-4.72	-6.00	-2.30	0.34	-1.96	8.53

In the 5.3G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)		Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A	ANT B				
802.11a	52	5260	-1.33	-2.16	1.29	0.16	1.45	8.53
	60	5300	-0.06	-1.39	2.34	0.16	2.50	8.53
	64	5320	-0.12	-1.29	2.34	0.16	2.50	8.53
802.11an HT20	52	5260	-2.15	-3.40	0.28	0.17	0.45	8.53
	60	5300	-2.06	-2.96	0.52	0.17	0.69	8.53
	64	5320	-2.38	-3.37	0.16	0.17	0.33	8.53
802.11an HT40	54	5270	-4.64	-5.73	-2.14	0.34	-1.80	8.53
	62	5310	-6.10	-7.48	-3.73	0.34	-3.39	8.53

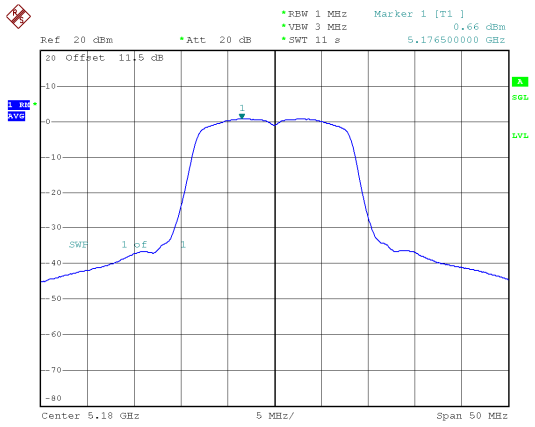
In the 5.5G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)		Sum chain (dBm)	Duty Cycle CF(dB)	Total Corr'd PPSD (dBm/MHz)	PPSD Limit (dBm/MHz)
			ANT A	ANT B				
802.11a	100	5500	0.53	0.38	3.47	0.16	3.63	8.53
	116	5580	1.35	1.51	4.44	0.16	4.60	8.53
	140	5700	0.45	0.05	3.26	0.16	3.42	8.53
802.11an HT20	100	5500	-0.45	-0.43	2.57	0.17	2.74	8.53
	116	5580	-0.27	-0.35	2.70	0.17	2.87	8.53
	140	5700	-0.49	-0.84	2.35	0.17	2.52	8.53
802.11an HT40	102	5510	-7.26	-6.50	-3.85	0.34	-3.51	8.53
	118	5550	-5.41	-5.04	-2.21	0.34	-1.87	8.53
	134	5670	-4.93	-5.28	-2.09	0.34	-1.75	8.53

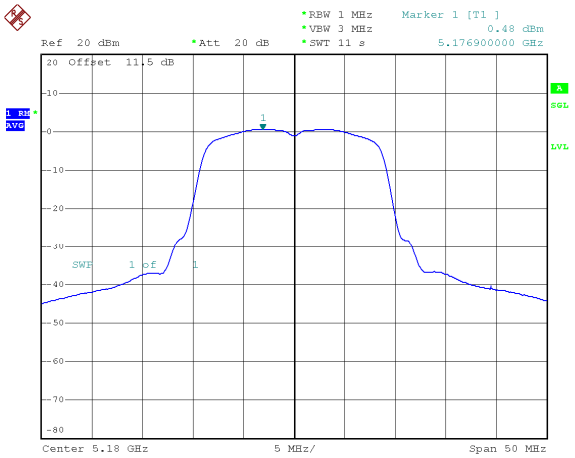
In the 5.8G Band

Modulation Type	CH	Freq. (MHz)	Meas PPSD (dBm/MHz)		Sum chain (dBm)	Duty Cycle CF(dB)	10log(500KHz /RBW) CF (dB)	Total Corr'd PPSD (dBm/ 500kHz)	PPSD Limit (dBm/ 500kHz)
			ANT A	ANT B					
802.11a	149	5745	0.98	1.27	4.14	0.16	-3.01	1.29	27.53
	157	5785	0.51	0.86	3.70	0.16	-3.01	0.85	27.53
	165	5825	-0.55	-0.17	2.65	0.16	-3.01	-0.20	27.53
802.11an HT20	149	5745	-1.87	-1.49	1.33	0.17	-3.01	-1.51	27.53
	157	5785	-2.24	-2.04	0.87	0.17	-3.01	-1.97	27.53
	165	5825	-2.31	-2.06	0.83	0.17	-3.01	-2.01	27.53
802.11an HT40	155	5755	-5.87	-5.22	-2.52	0.34	-3.01	-5.19	27.53
	159	5795	-5.86	-5.39	-2.61	0.34	-3.01	-5.28	27.53

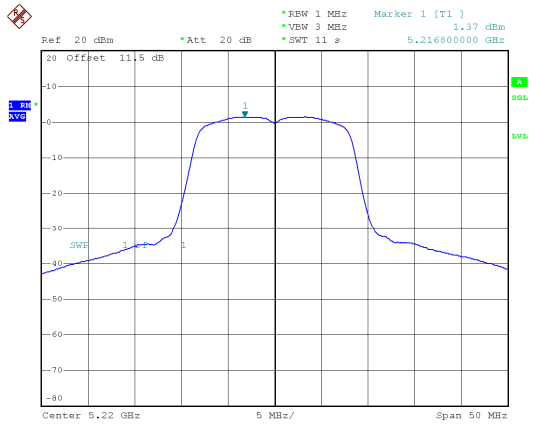
Band 1, 1TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH36



Modulation Standard: 802.11an HT20 (6.5Mbps)
CH36



CH44



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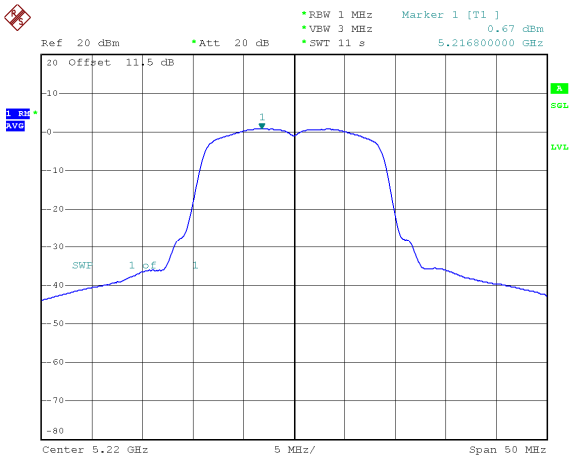
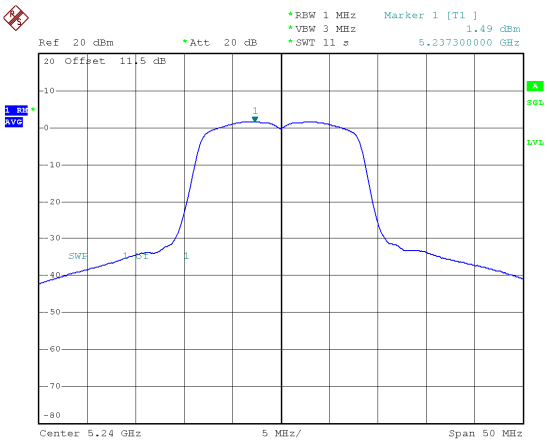


CH48



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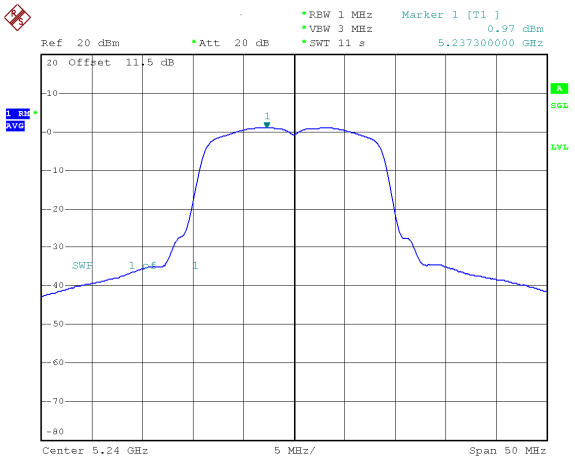
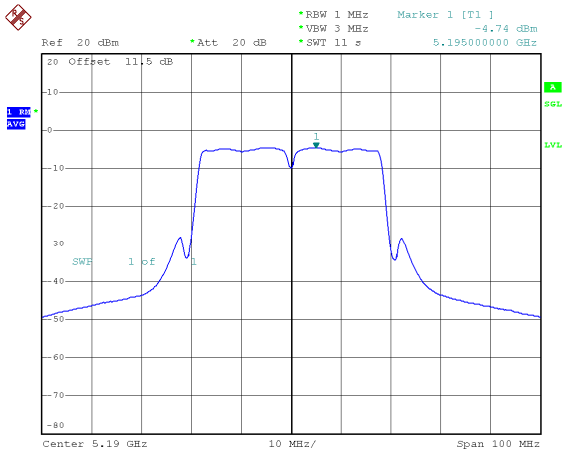
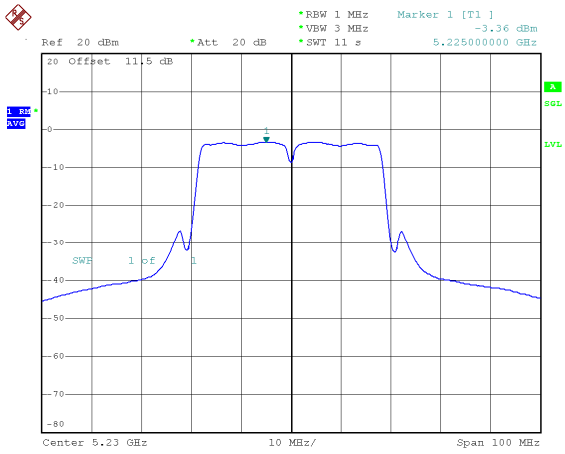


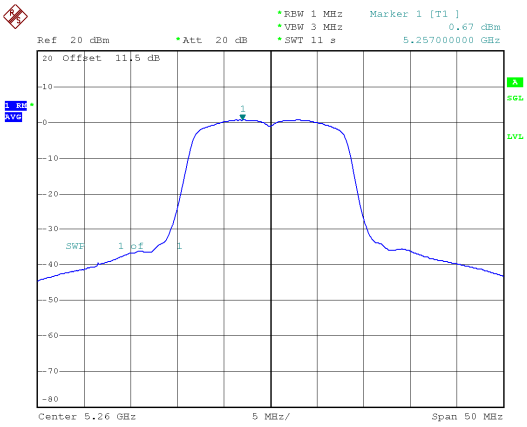
Band 1, 1TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH38



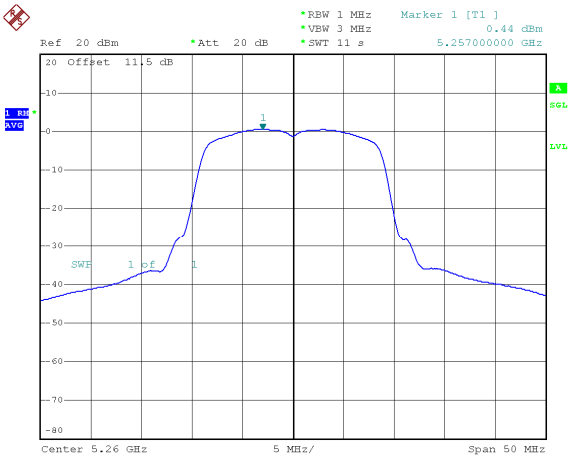
CH46



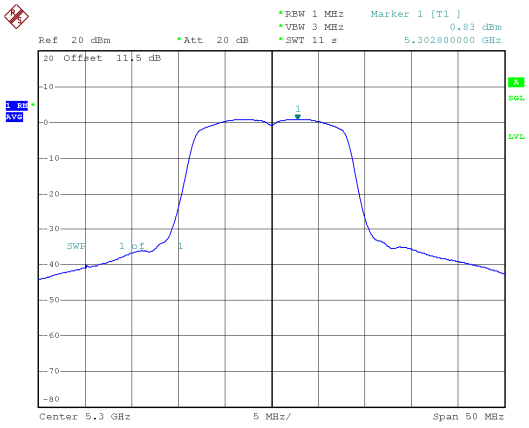
Band 2, 1TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH52



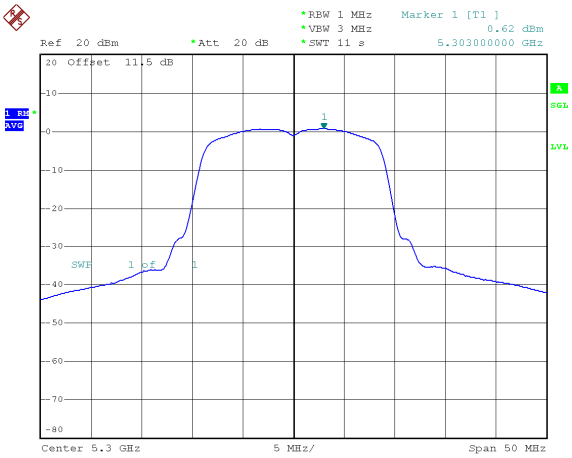
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH52



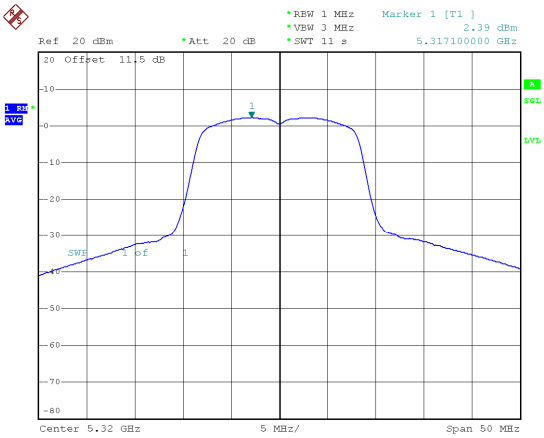
CH60



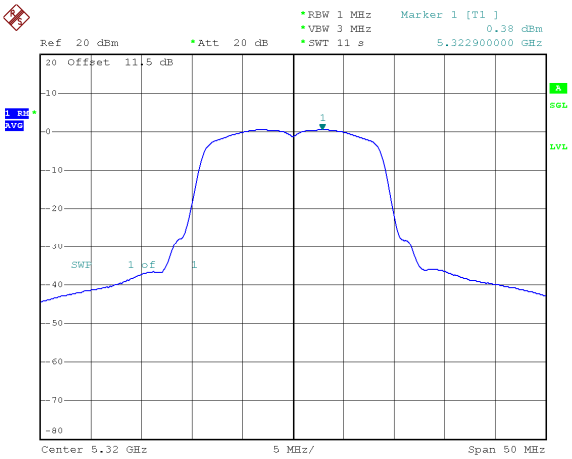
CH60



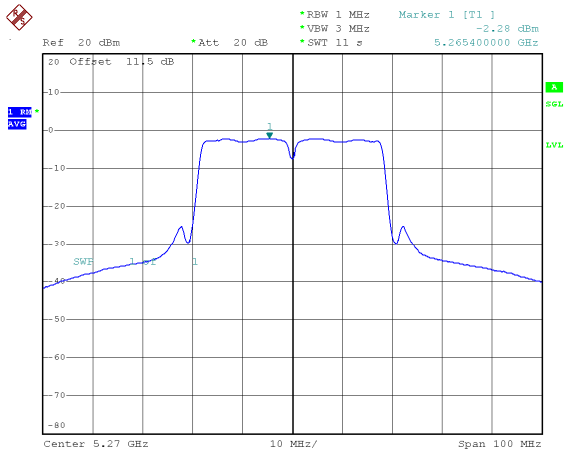
CH64



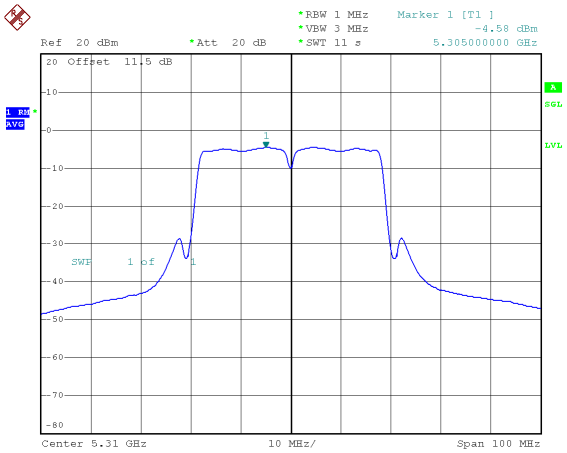
CH64



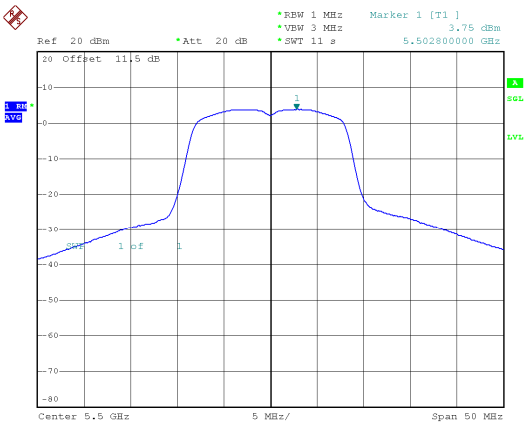
Band 2, 1TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH54



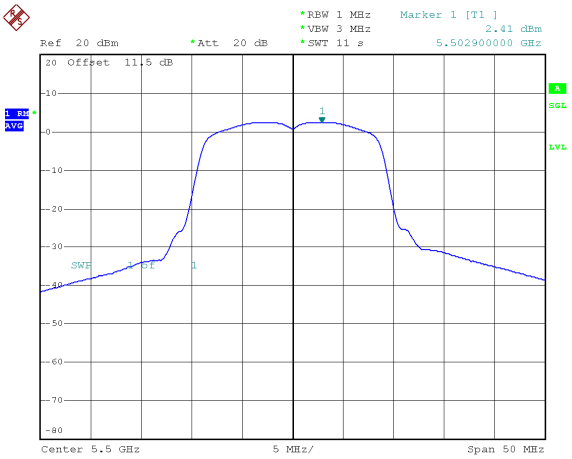
CH62



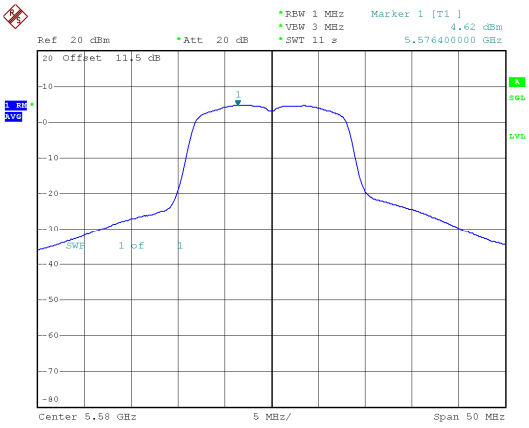
Band 3, 1TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH100



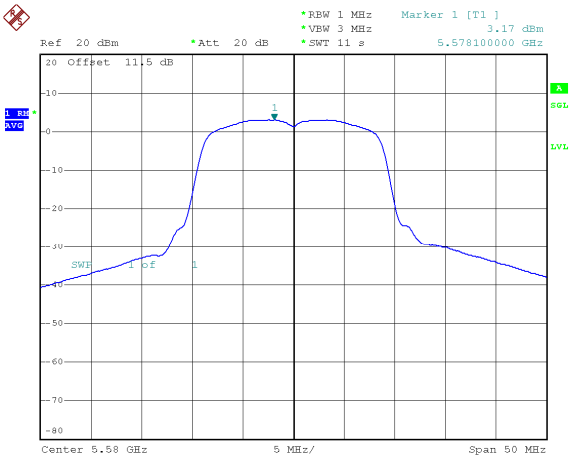
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH100



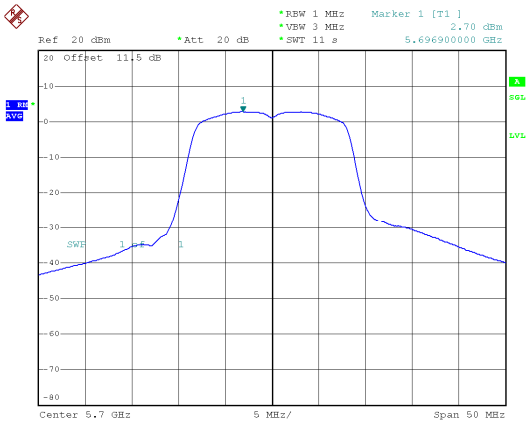
CH116



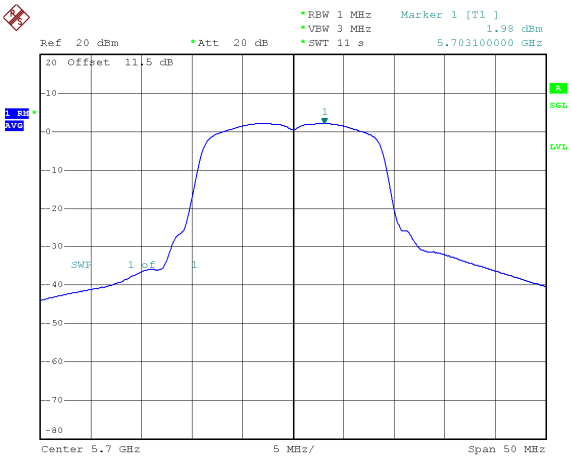
CH116



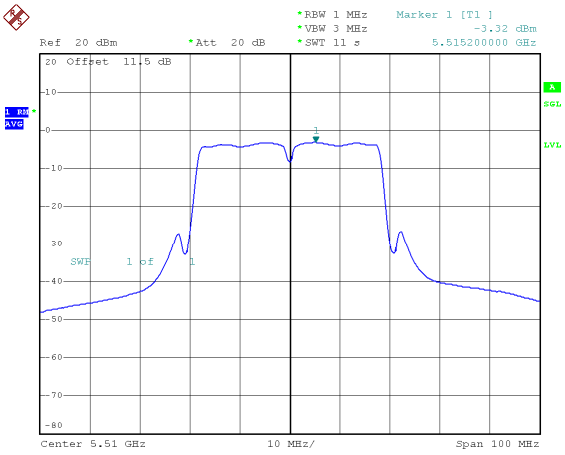
CH140



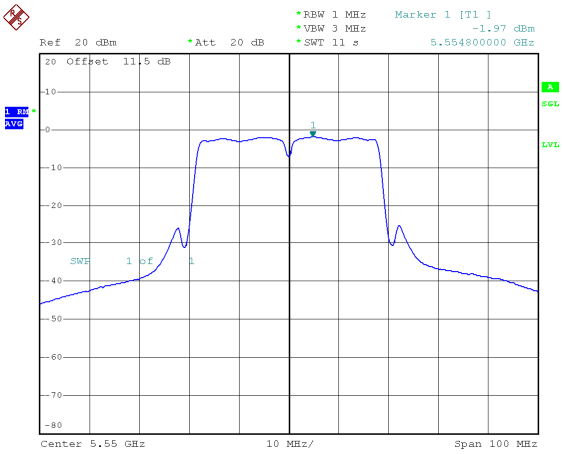
CH140



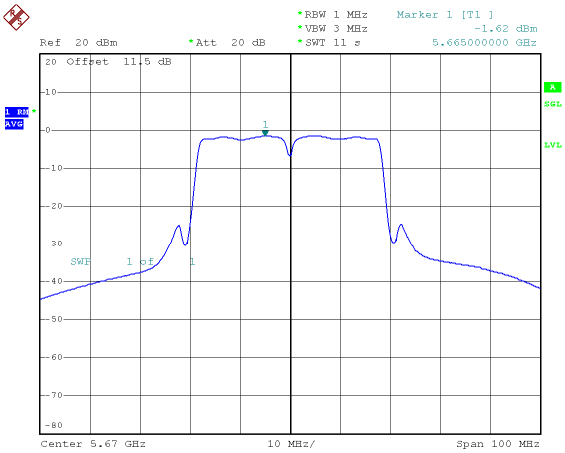
Band 3, 1TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH102



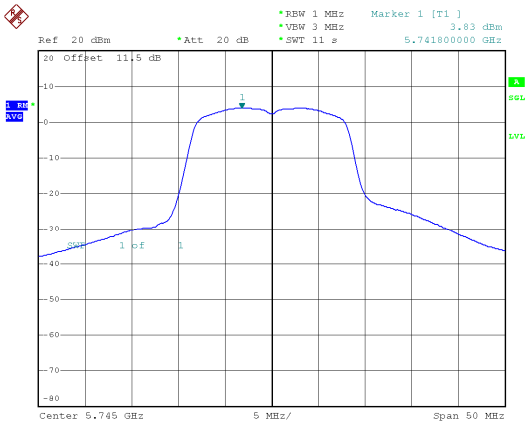
CH110



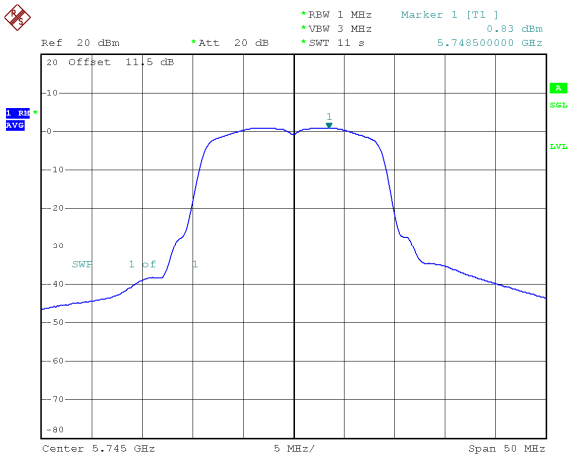
CH134



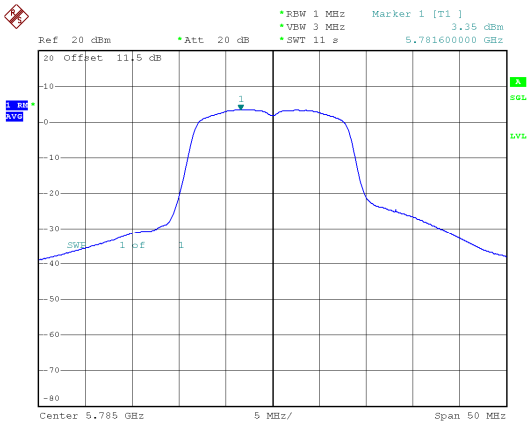
Band 4, 1TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH149



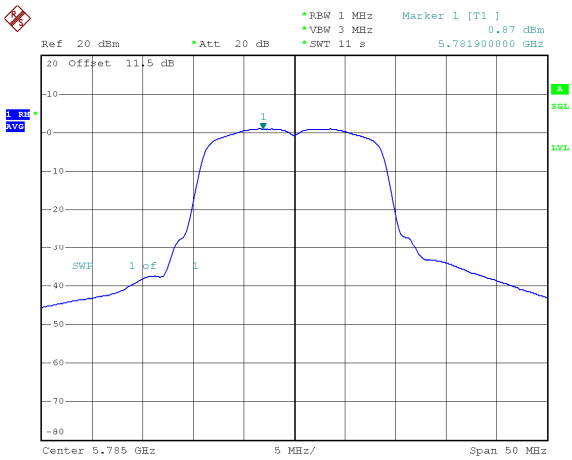
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH149



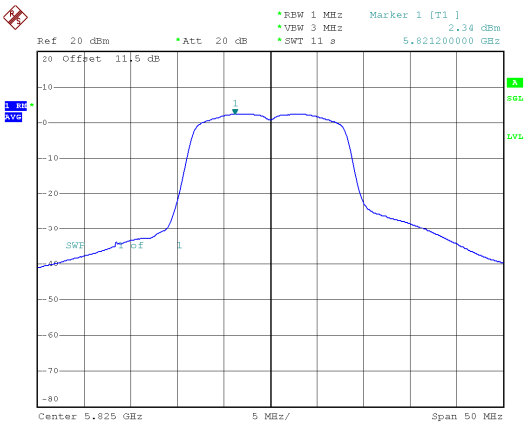
CH157



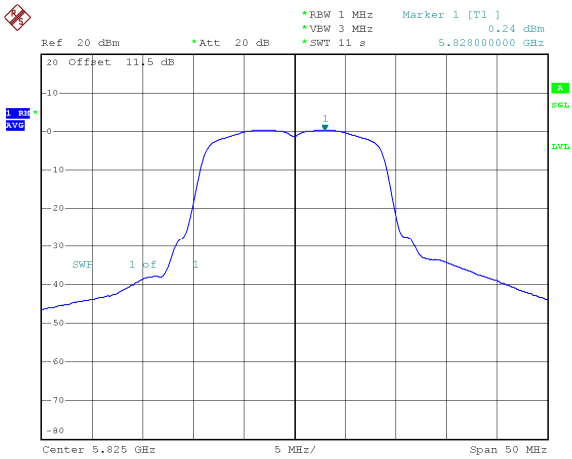
CH157



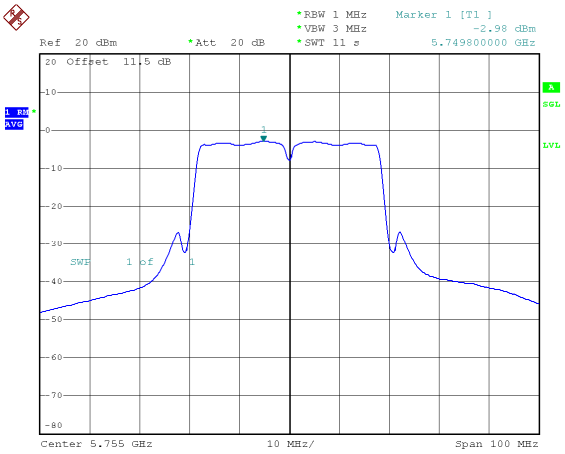
CH165



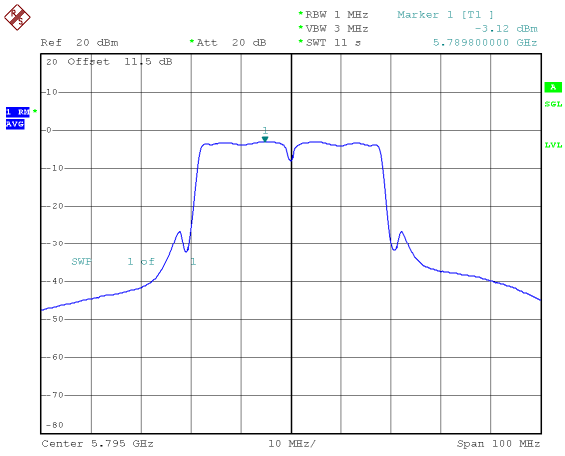
CH165



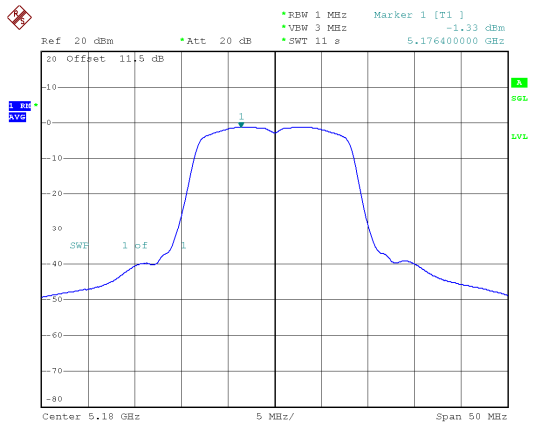
Band 4, 1TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH155



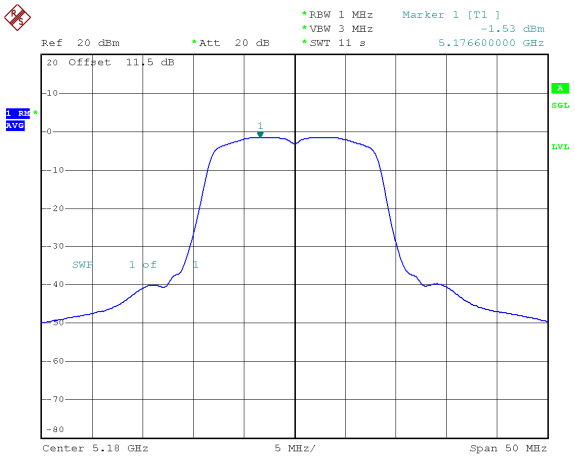
CH159



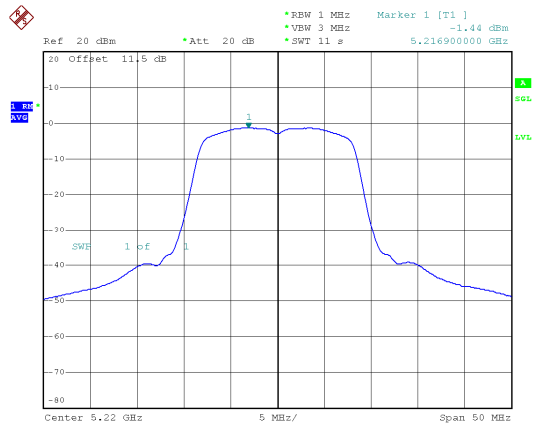
Band 1, 2TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH36



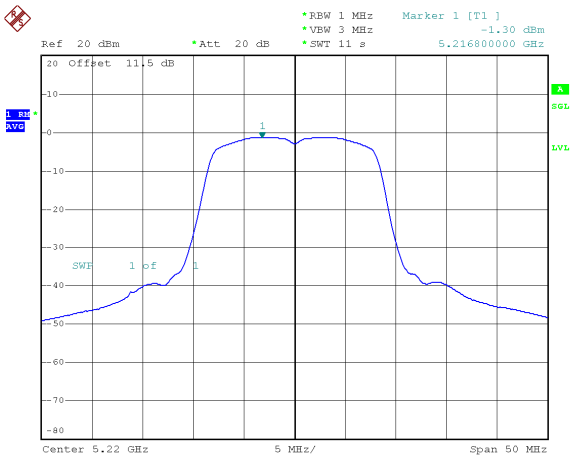
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH36



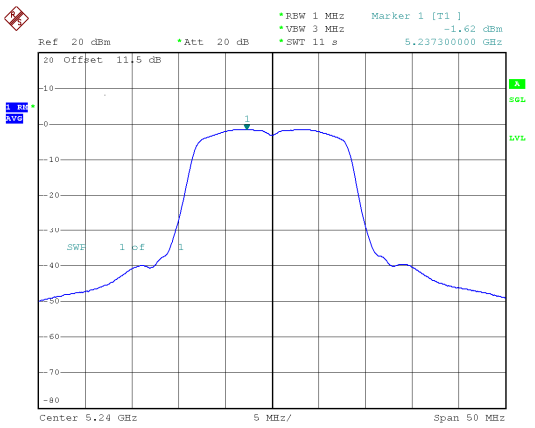
CH44



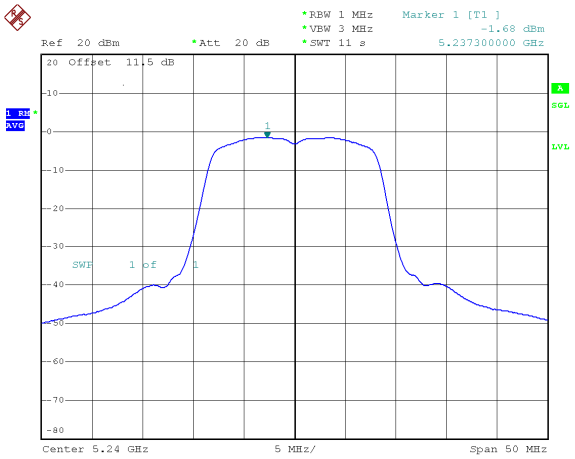
CH44



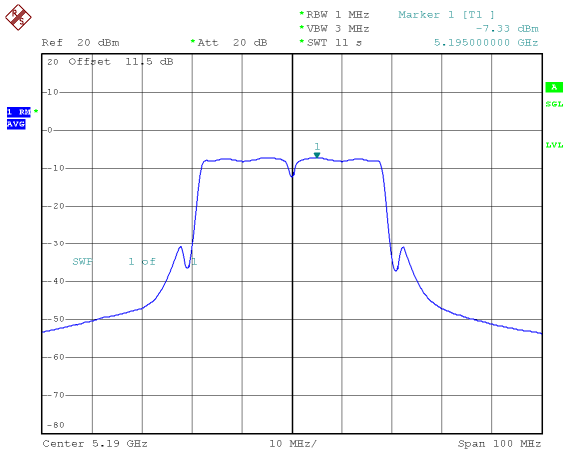
CH48



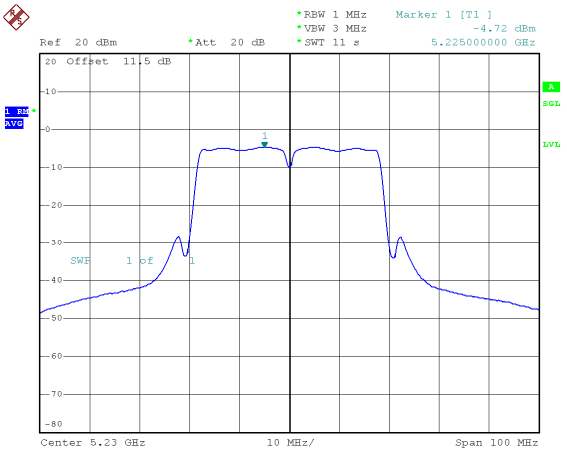
CH48



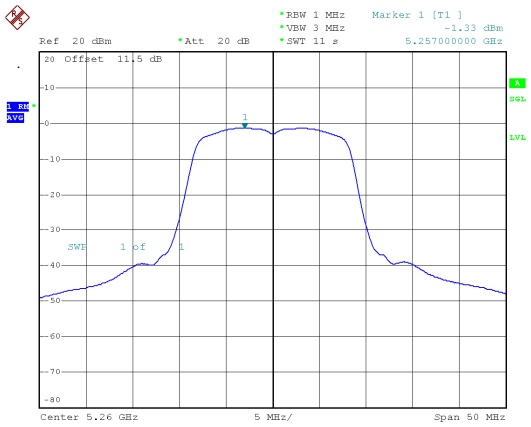
Band 1, 2TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH38



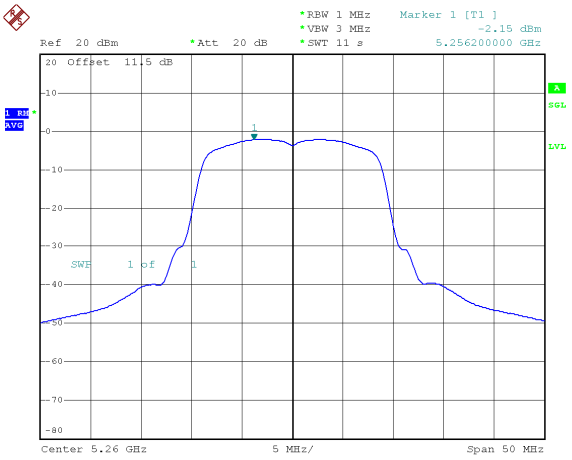
CH46



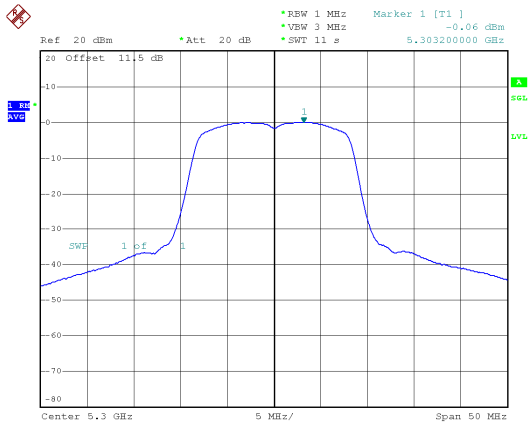
Band 2, 2TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH52



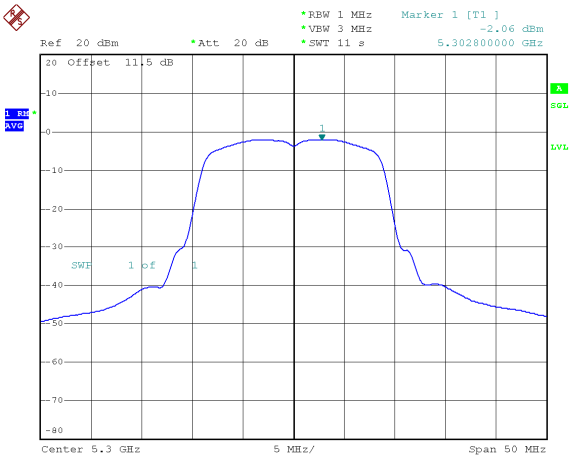
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH52



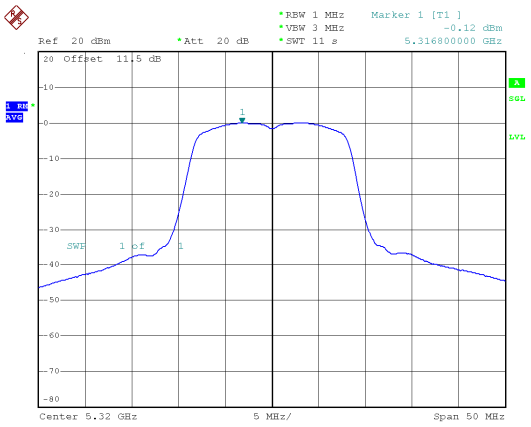
CH60



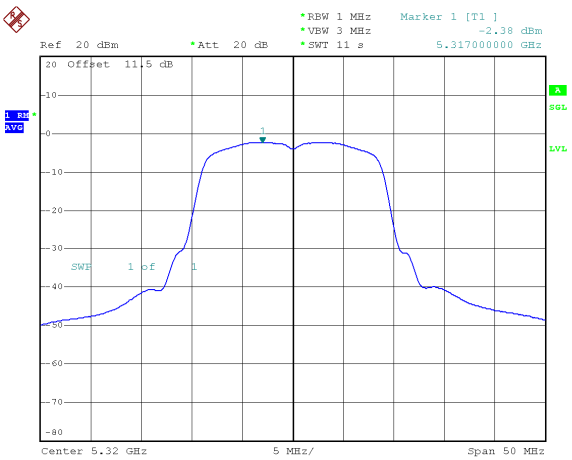
CH60



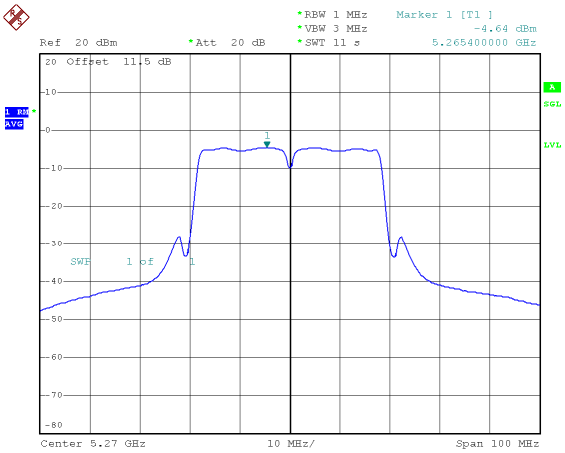
CH64



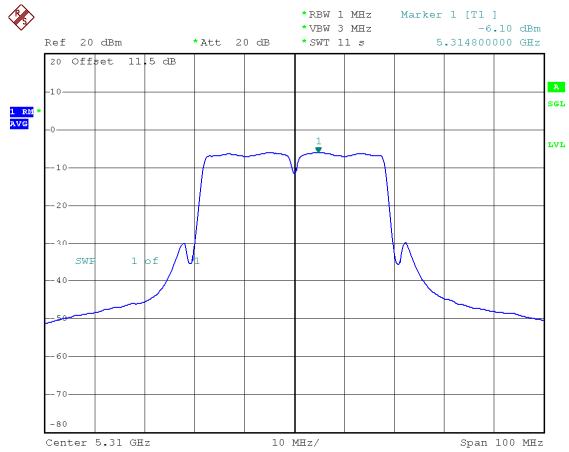
CH64



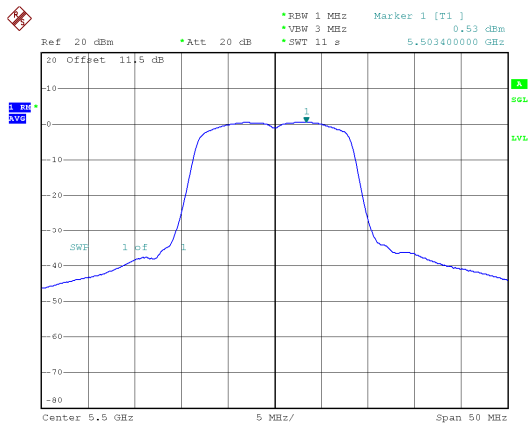
Band 2, 2TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH54



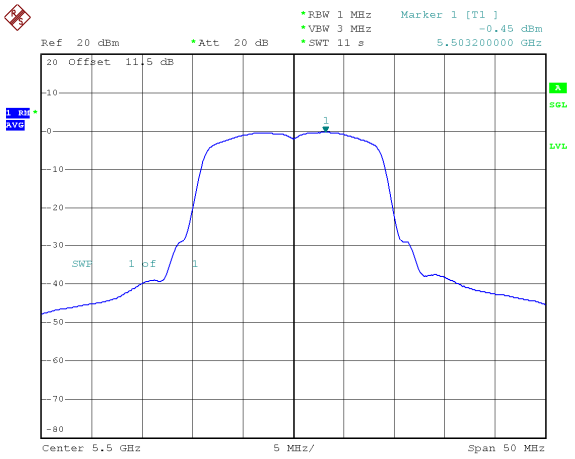
CH62



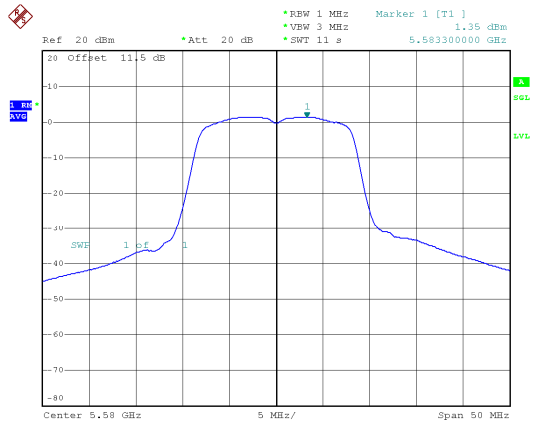
Band 3, 2TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH100



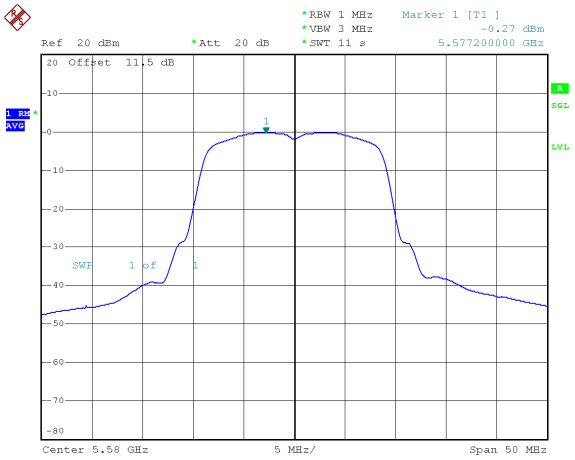
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH100



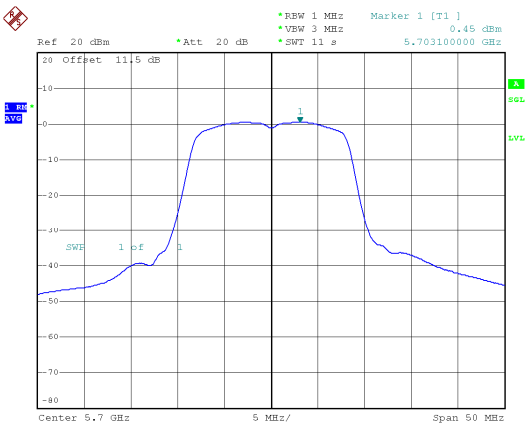
CH116



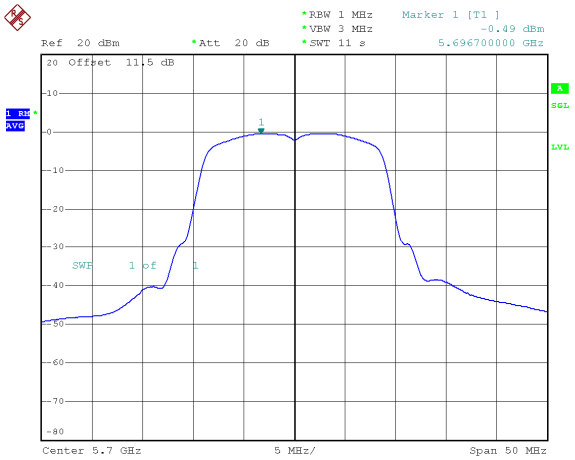
CH116



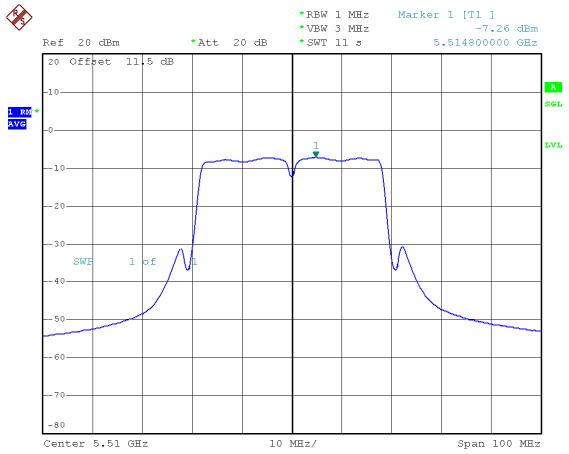
CH140



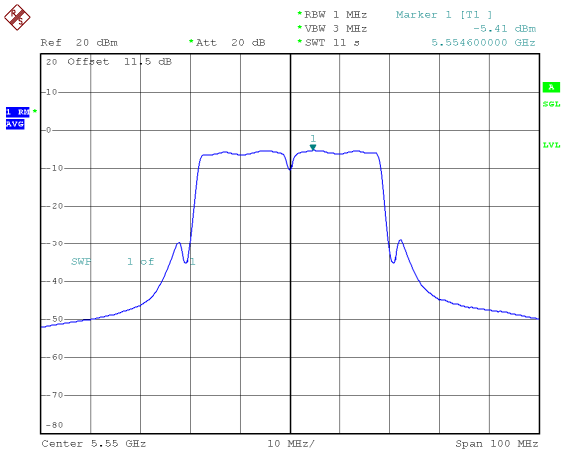
CH140



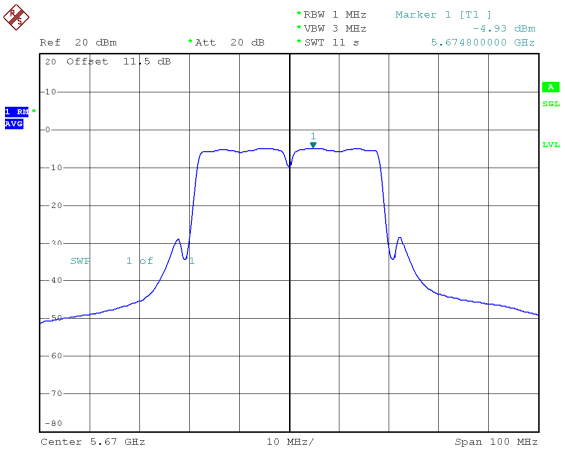
Band 3, 2TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH102



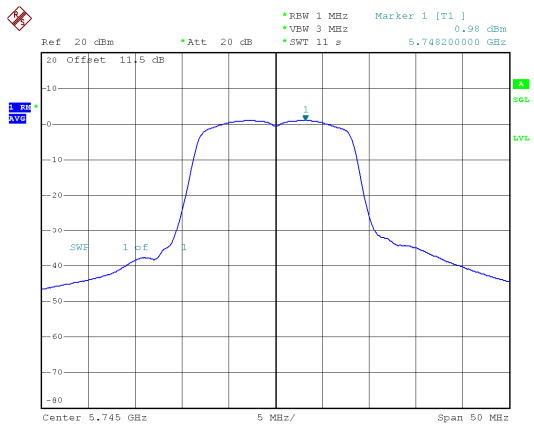
CH110



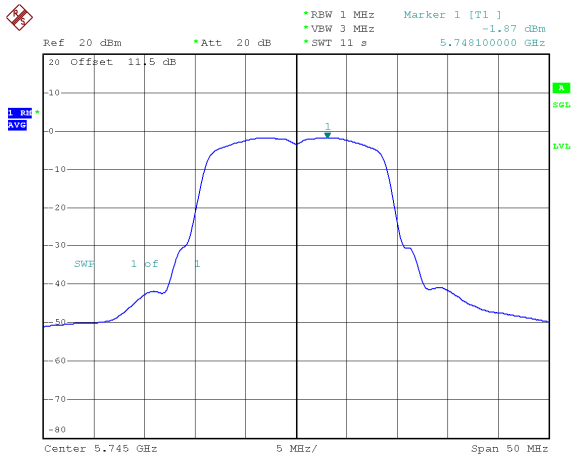
CH134



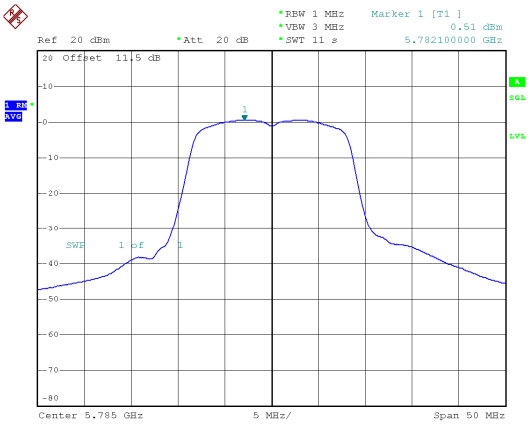
Band 4, 2TX: ANT A
Modulation Standard: 802.11a (6Mbps)
CH149



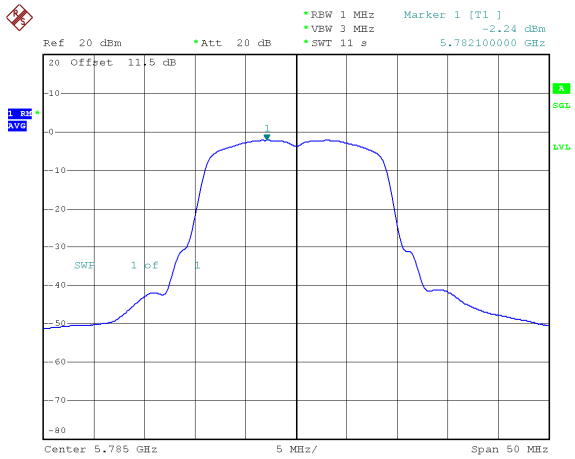
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH149



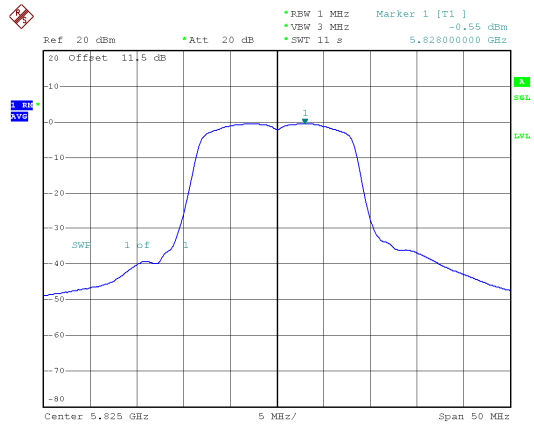
CH157



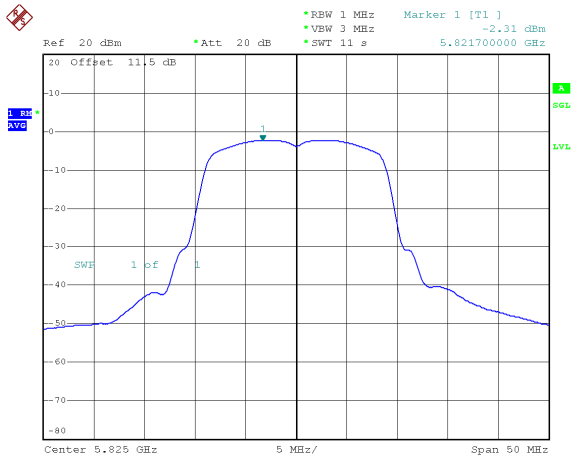
CH157



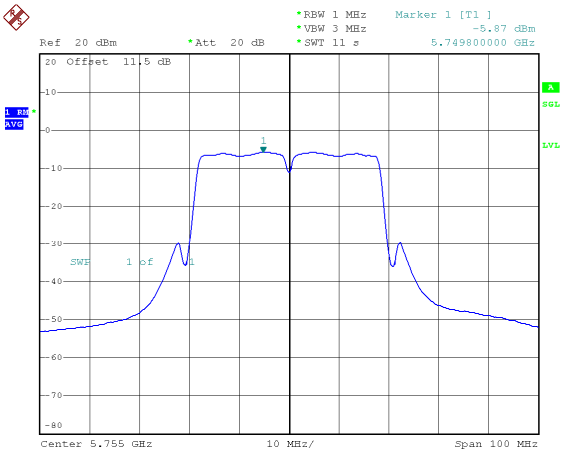
CH165



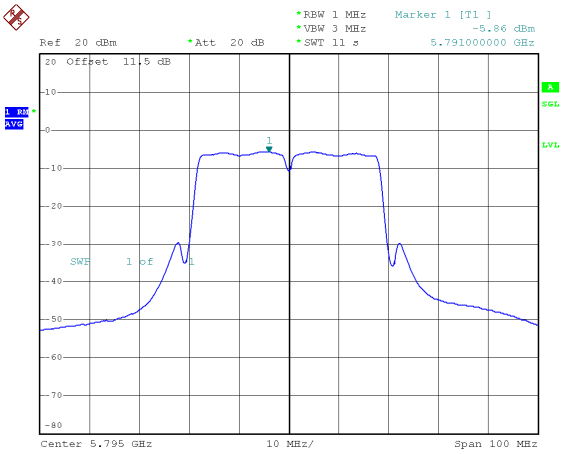
CH165



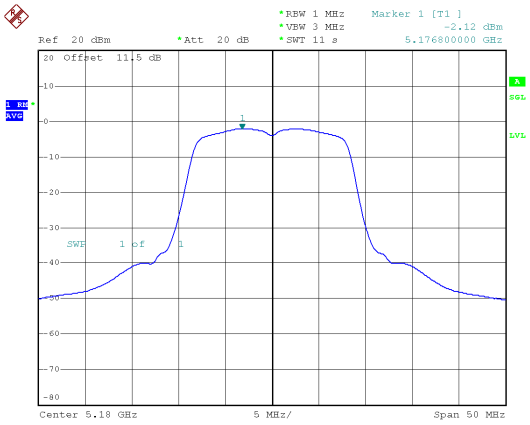
Band 4, 2TX: ANT A
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH155



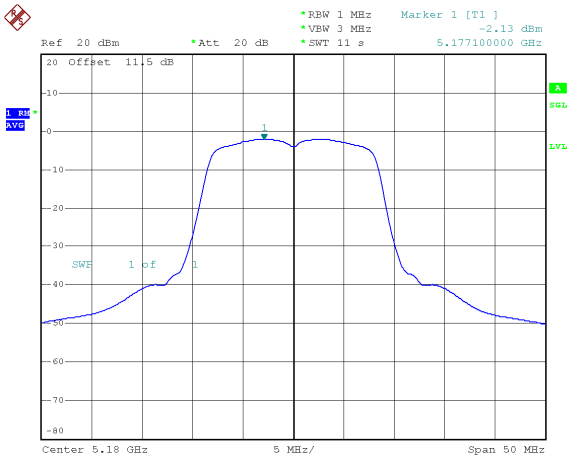
CH159



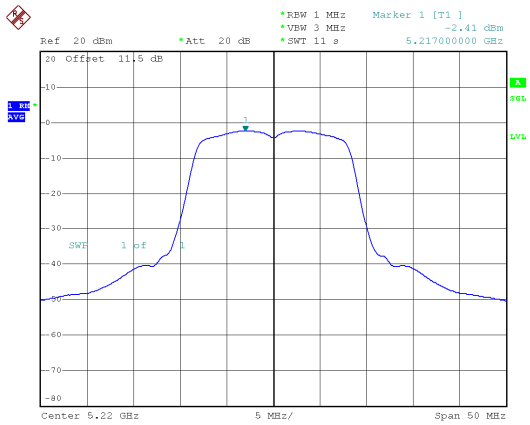
Band 1, 2TX: ANT B
Modulation Standard: 802.11a (6Mbps)
CH36



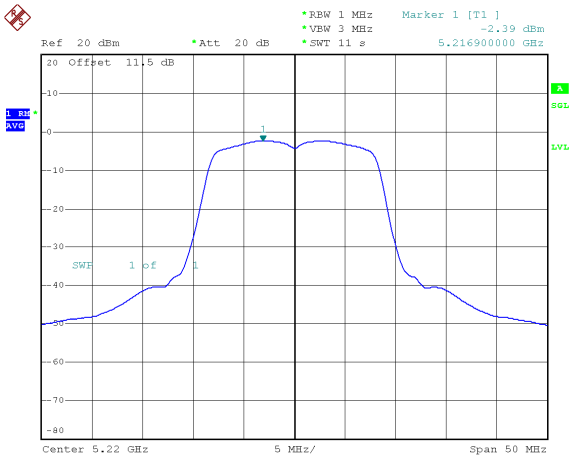
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH36



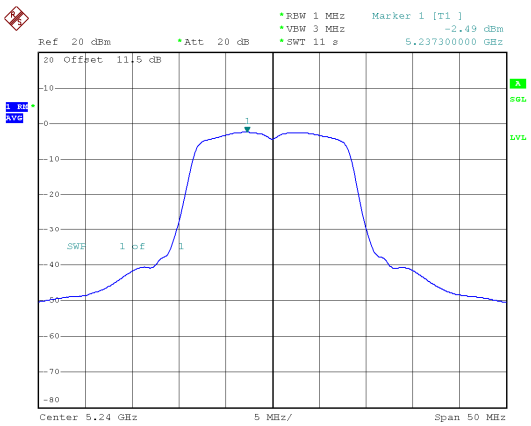
CH44



CH44



CH48



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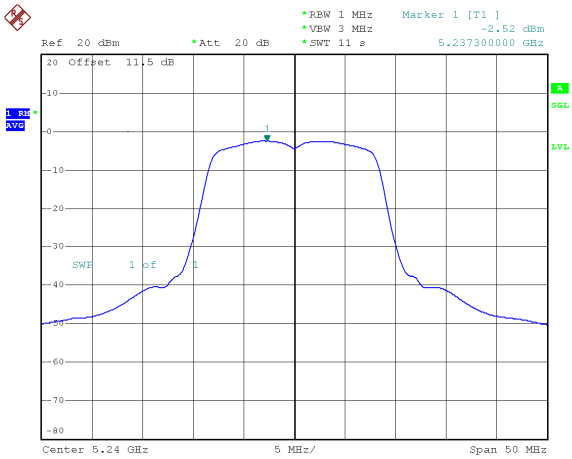
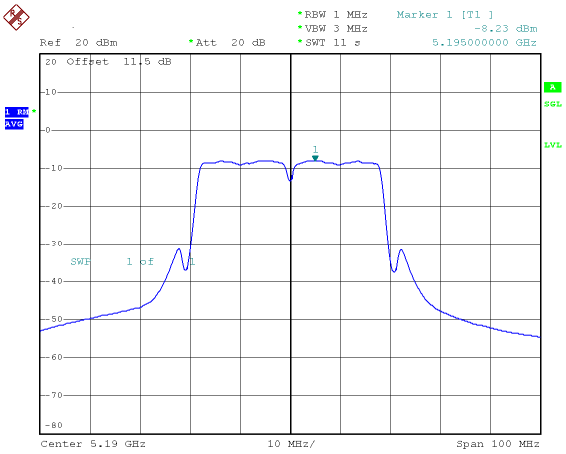
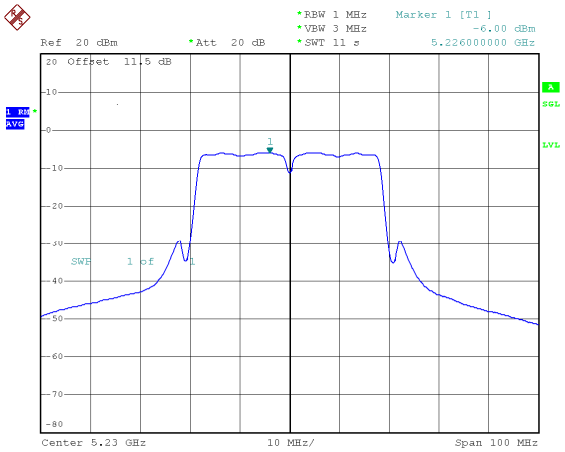


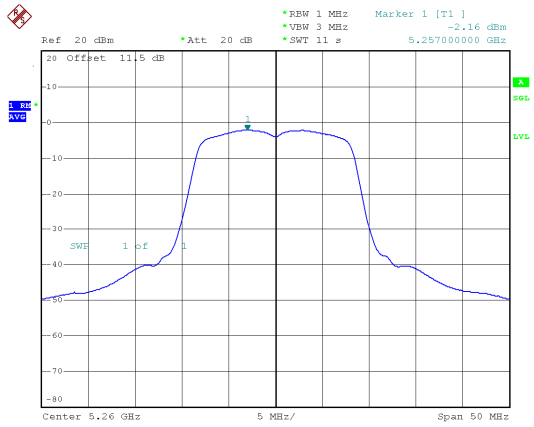
Band 1, 2TX: ANT B
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH38



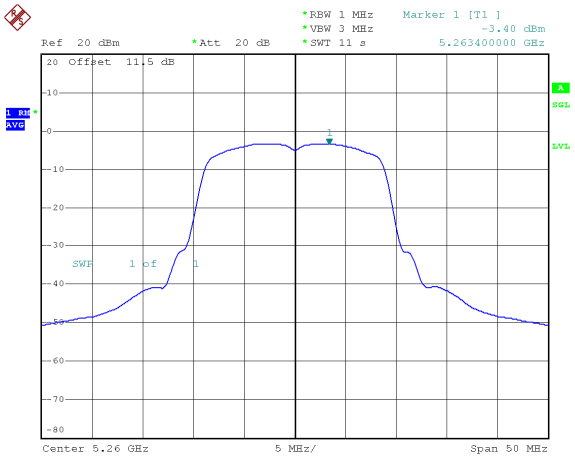
CH46



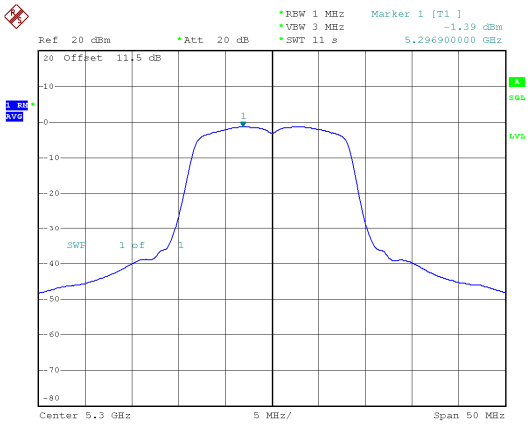
Band 2, 2TX: ANT B
Modulation Standard: 802.11a (6Mbps)
CH52



Modulation Standard: 802.11an HT20 (6.5Mbps)
CH52



CH60



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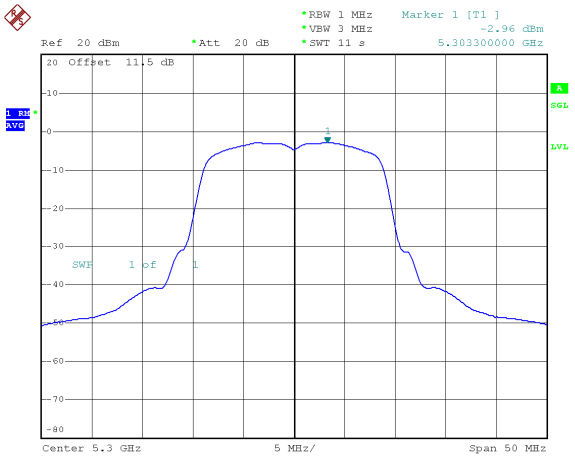
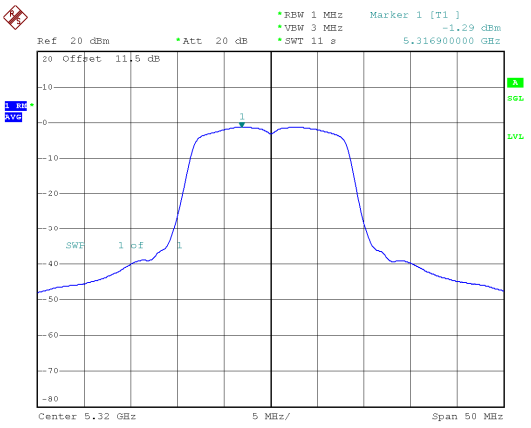
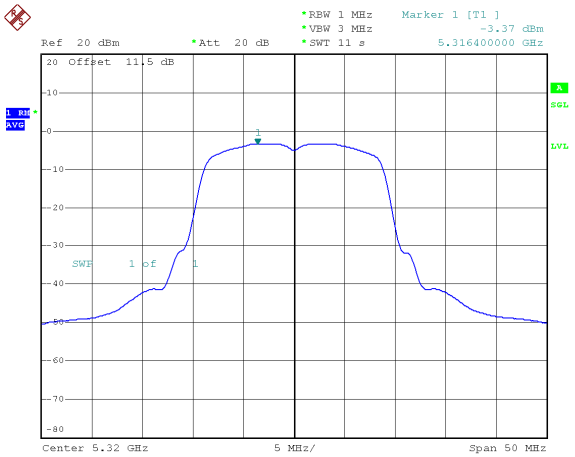


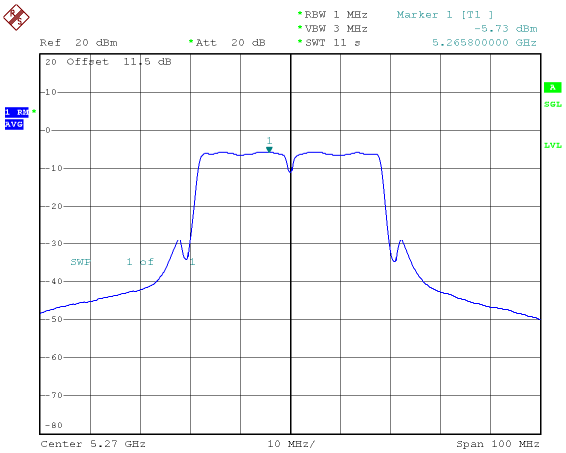
CH64



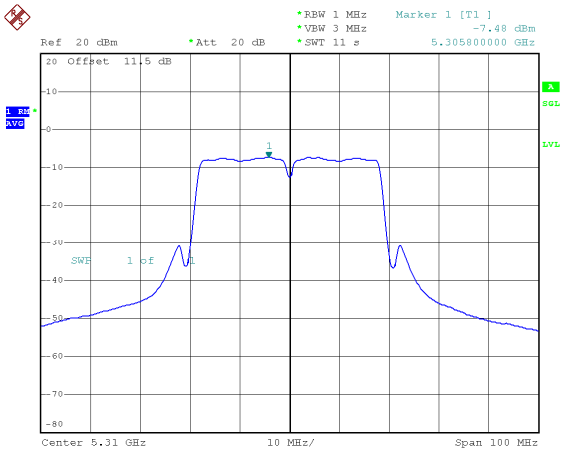
CH64



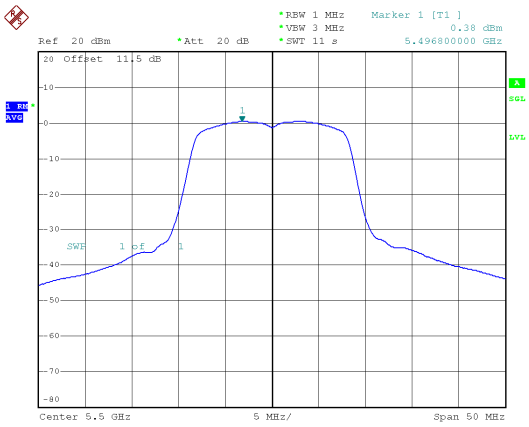
Band 2, 2TX: ANT B
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH54



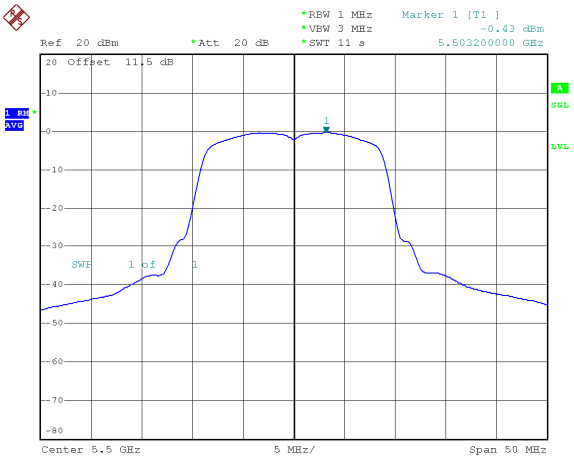
CH62



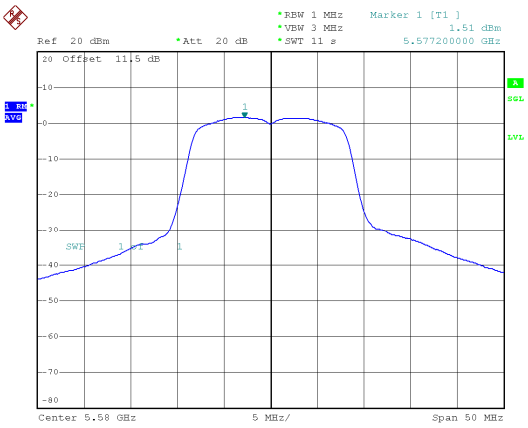
Band 3, 2TX: ANT B
Modulation Standard: 802.11a (6Mbps)
CH100



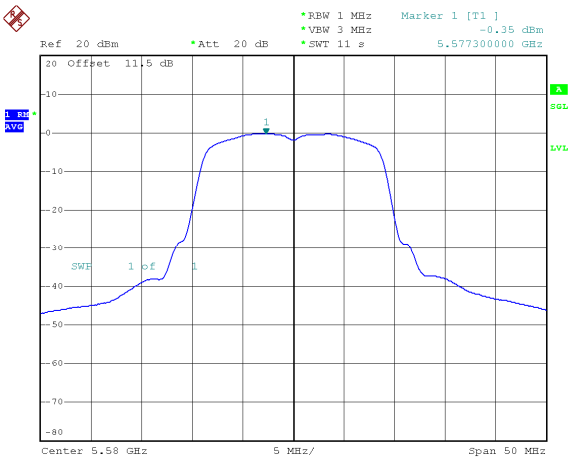
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH100



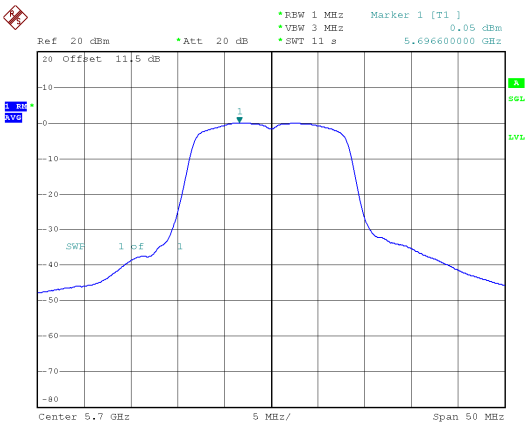
CH116



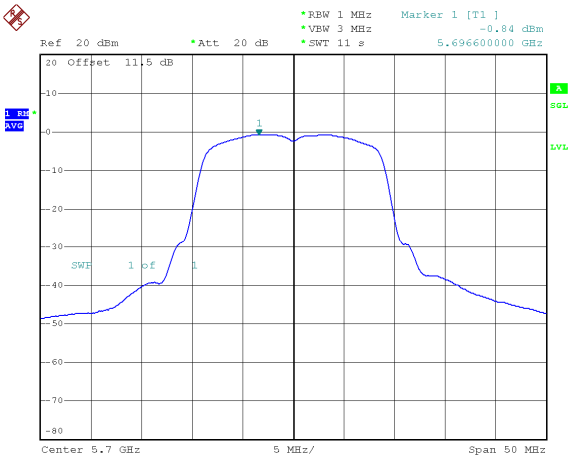
CH116



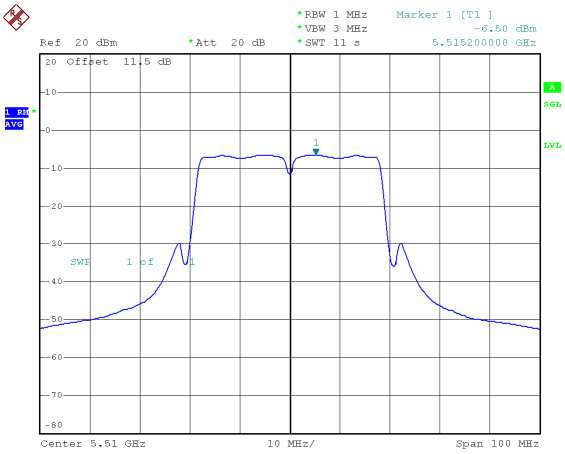
CH140



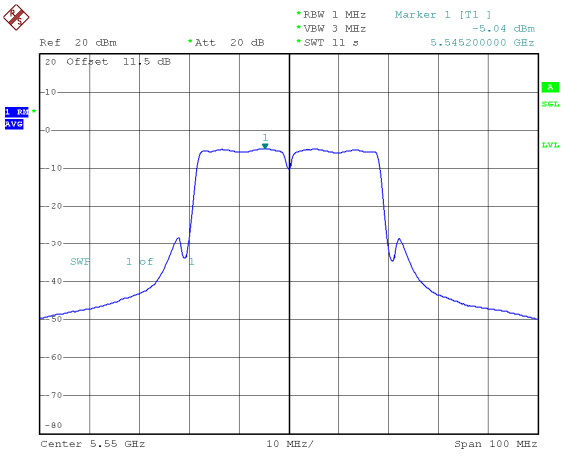
CH140



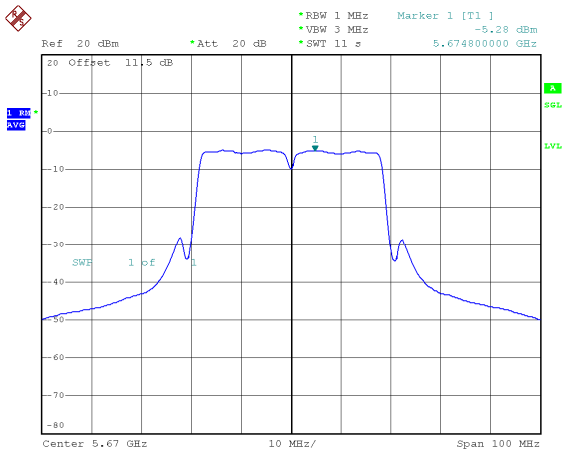
Band 3, 2TX: ANT B
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH102



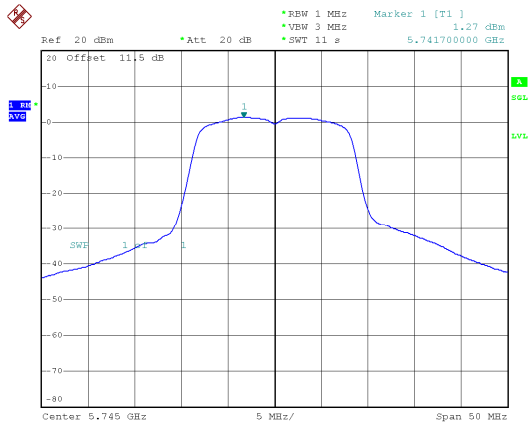
CH110



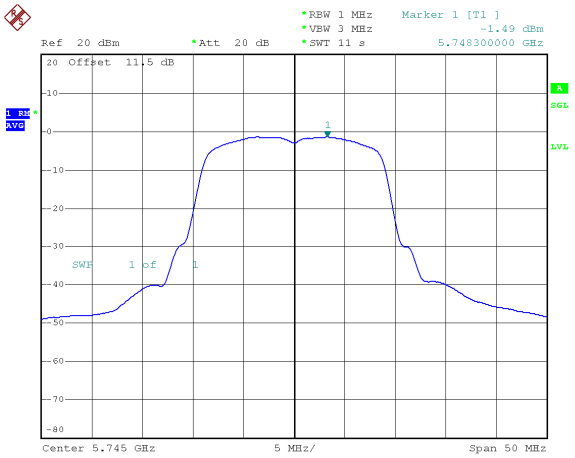
CH134



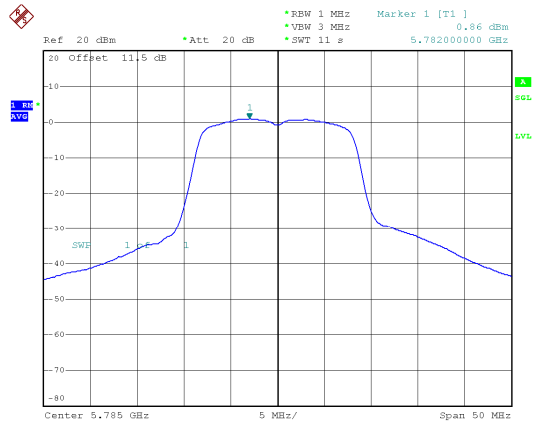
Band 4, 2TX: ANT B
Modulation Standard: 802.11a (6Mbps)
CH149



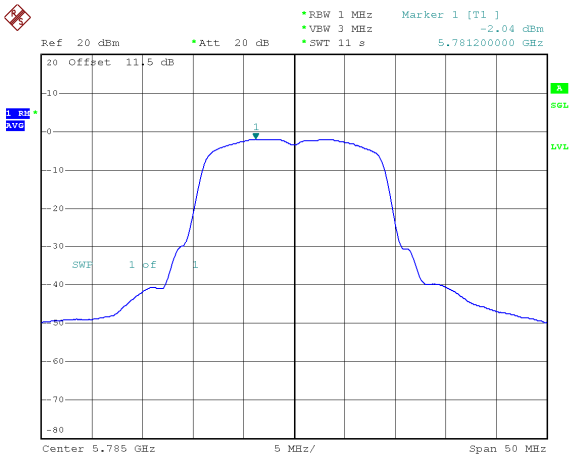
Modulation Standard: 802.11an HT20 (6.5Mbps)
CH149



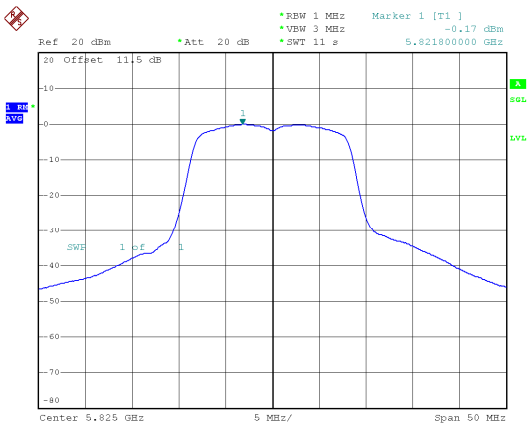
CH157



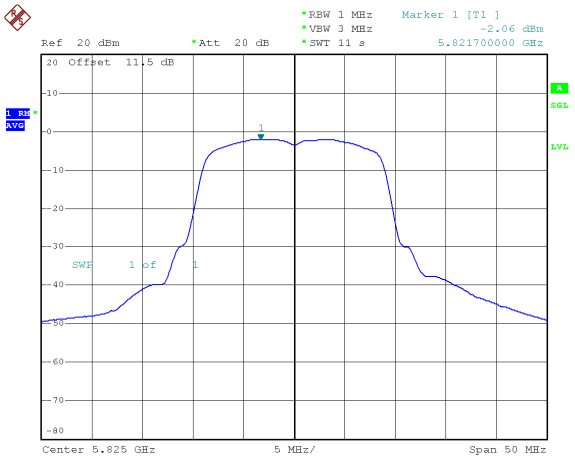
CH157



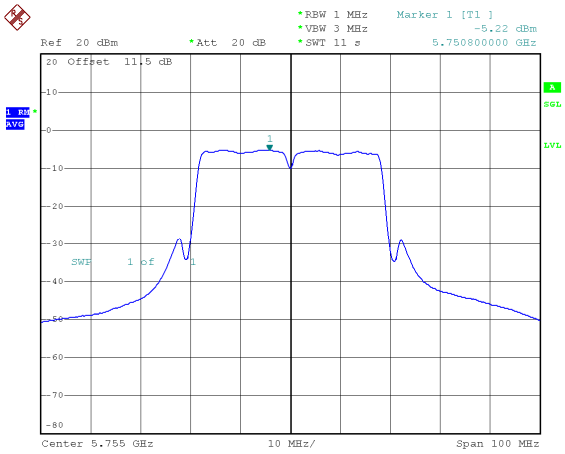
CH165



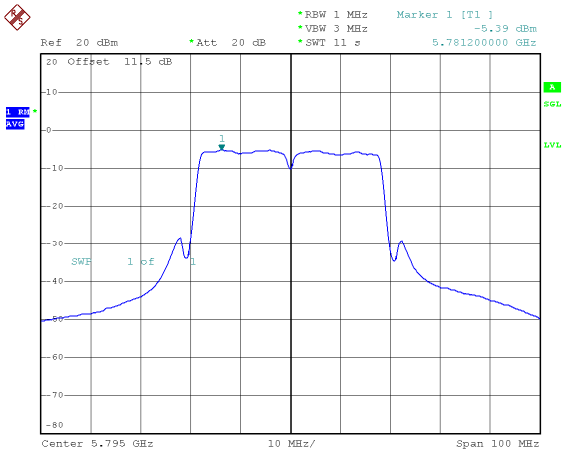
CH165



Band 4, 2TX: ANT B
Modulation Standard: 802.11an HT40 (13.5Mbps)
CH155



CH159

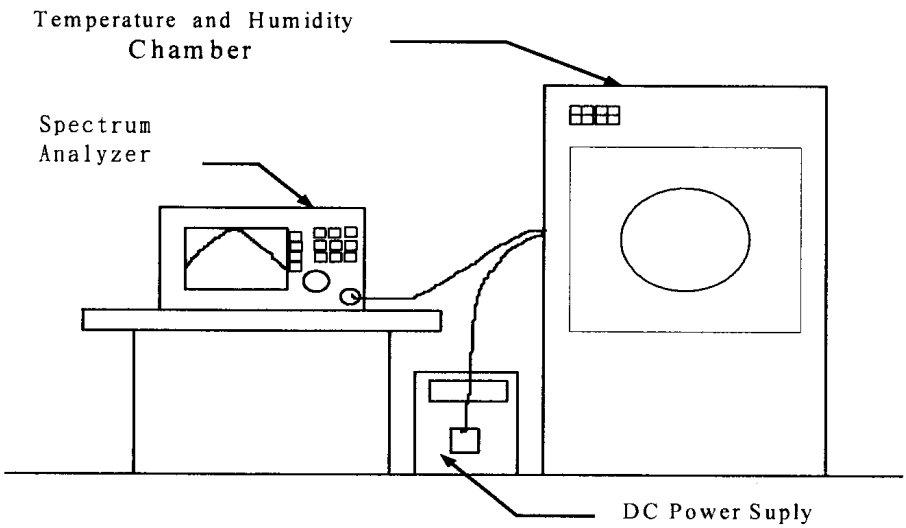


12. Frequency Stability

12.1.Test Procedure

1. The EUT was placed inside the Temperature and Humidity chamber.
2. The transmitter output was connected to spectrum analyzer.
3. Turn the EUT on and couple its output to a spectrum analyzer.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
6. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
7. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

12.2.Test Setup Layout



12.3.Test Result and Data

Temperature: 23°C Humidity: 60%

Test Date: Sep. 19, 2017 Test Mode: TX

Operating frequency: 5180 MHz							
Temp	Power supply	2 minute		5 minute		10 minute	
(℃)	(V)	(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	102	5179.9069	-0.001797	5179.9877	-0.000237	5179.9859	-0.000271
	120	5179.9598	-0.000776	5180.0087	0.000168	5180.0785	0.001515
	138	5180.0222	0.000429	5179.9977	-0.000044	5179.9571	-0.000829
40	102	5179.9475	-0.001014	5180.0767	0.001481	5179.9676	-0.000626
	120	5180.0360	0.000694	5179.9802	-0.000382	5180.0306	0.000591
	138	5179.9852	-0.000286	5179.9752	-0.000479	5180.0978	0.001889
30	102	5179.9716	-0.000549	5180.0970	0.001872	5179.9440	-0.001081
	120	5180.0184	0.000355	5179.9833	-0.000323	5180.0765	0.001478
	138	5180.0823	0.001589	5180.0576	0.001113	5179.9011	-0.001909
20	102	5180.0143	0.000276	5179.9337	-0.001280	5180.0209	0.000403
	120	5180.0451	0.000871	5179.9227	-0.001493	5179.9516	-0.000934
	138	5180.0735	0.001418	5179.9172	-0.001598	5179.9155	-0.001631
10	102	5180.0915	0.001766	5179.9515	-0.000936	5179.9216	-0.001514
	120	5180.0719	0.001389	5180.0173	0.000333	5179.9448	-0.001066
	138	5180.0148	0.000285	5180.0732	0.001413	5180.0821	0.001584
0	102	5180.0617	0.001191	5180.0231	0.000445	5179.9997	-0.000006
	120	5180.0018	0.000034	5179.9912	-0.000170	5180.0929	0.001793
	138	5179.9160	-0.001621	5179.9131	-0.001677	5180.0859	0.001658
-10	102	5180.0352	0.000679	5180.0907	0.001751	5179.9843	-0.000303
	120	5180.0529	0.001020	5179.9900	-0.000194	5180.0322	0.000621
	138	5180.0447	0.000863	5180.0663	0.001280	5180.0098	0.000190
-20	102	5179.9374	-0.001209	5179.9549	-0.000871	5180.0179	0.000345
	120	5179.9428	-0.001104	5180.0745	0.001438	5180.0115	0.000223
	138	5180.0459	0.000886	5180.0746	0.001440	5179.9721	-0.000538
-30	102	5179.9921	-0.000152	5179.9787	-0.000410	5180.0975	0.001883
	120	5180.0959	0.001851	5180.0454	0.000876	5180.0951	0.001835
	138	5179.9394	-0.001170	5180.0286	0.000553	5179.9180	-0.001583

Limit:

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

13. Automatically Discontinue Transmission

13.1. Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

13.2. Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

14. Dynamic Frequency Selection

14.1. List of Measurement and Examinations

EUT Applicability of DFS requirements and Frequency Range

Operation Mode		Operating Frequency Range	
		5250-5350MHz	5470-5725MHz (5600MHz-5650MHz will be disable)
Master	--	--	--
Client without radar detection	√	√	√
Client with radar detection	--	--	--

DEVICES WITH RADAR DETECTION

MAXIMUM TRANSMIT POWER	VALUE (SEE Note 1 and 2)
≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911	

Table1: Applicability of DFS requirements prior to use of a channel

REQUIREMENT RADAR	OPERATIONAL MODE		
	MASTER	CLIENT WITHOUT RADAR DETECTION	CLIENT WITH RADAR DETECTION
Non-Occupancy Period	V	V_{Note}	V
DFS Detection Threshold	V	Not required	V
Channel Availability Check Time	V	Not required	Not required
U-NII Detection Bandwidth	V	Not required	V
Note: Regarding KDB 905462 D03 Client Without DFS New Rules section (b)(5/6), If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear. An analyzer plot that contains a single 30-minute sweep on the original channel.			

Table2: Applicability of DFS requirements during normal operation

REQUIREMENT RADAR	OPERATIONAL MODE		
	MASTER	CLIENT WITHOUT RADAR DETECTION	CLIENT WITH RADAR DETECTION
DFS Detection Threshold	V	Not required	V
Channel Closing Transmission Time	V	V	V
Channel Move Time	V	V	V
U-NII Detection Bandwidth	V	Not required	V

Additional requirements for devices with multiple bandwidth modes	Master or Client with radar detection	Client without radar detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

14.2. Test Setup

Setup for Master with injection at the Master

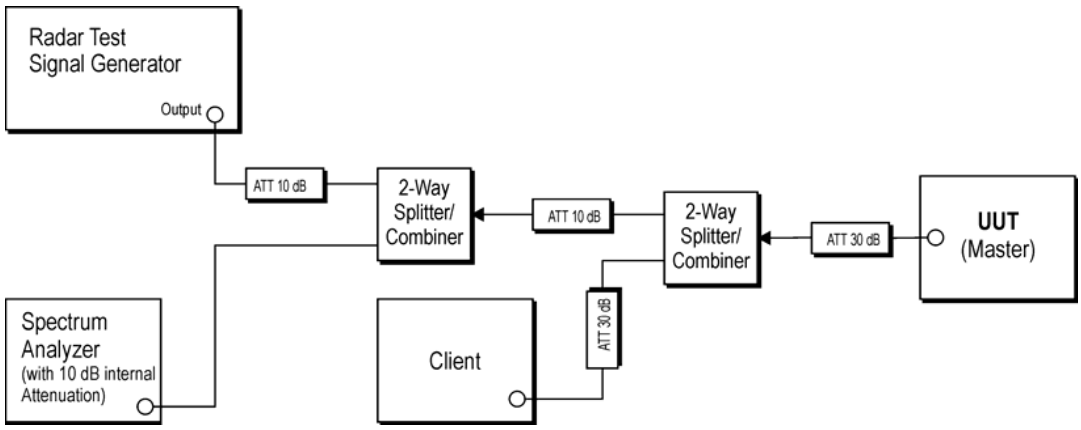


Figure 1: Example Conducted Setup where UUT is a Master and Radar Test Waveforms are injected into the Master

Setup for Client with injection at the Master

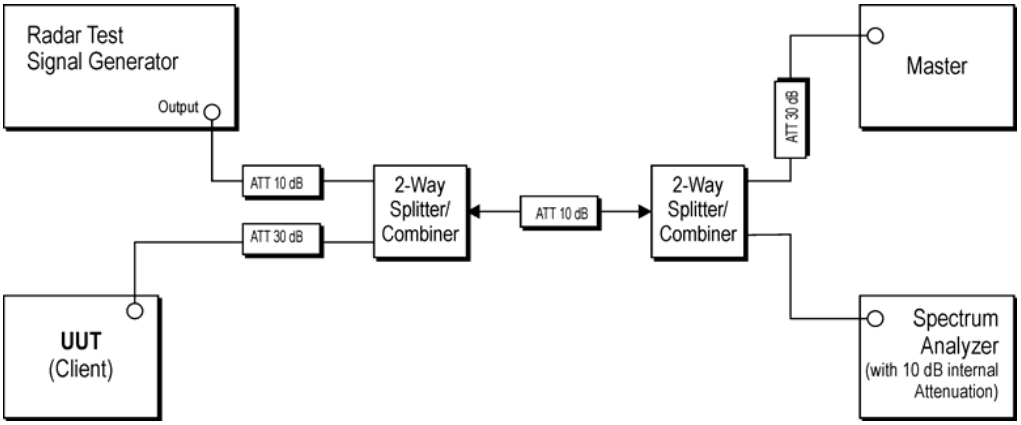


Figure 2: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Master

Setup for Client with injection at the Client

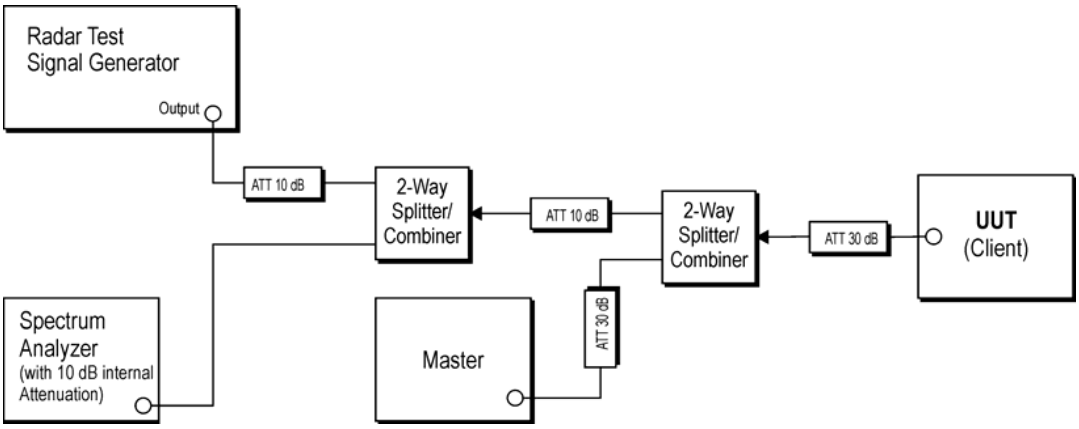


Figure 3: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Client

14.3. Non-Occupancy Period

The Channel Shutdown is defined as the process initiated by the RLAN device immediately after a radar signal has been detected on an Operating Channel.

The master device shall instruct all associated slave devices to stop transmitting on this channel, which they shall do within the Channel Move Time.

Slave devices with a Radar Interference Detection function, shall stop their own transmissions within the Channel Move Time.

The aggregate duration of all transmissions of the RLAN device on this channel during the Channel Move Time shall be limited to the Channel Closing Transmission Time. The aggregate duration of all transmissions shall not include quiet periods in between transmissions.

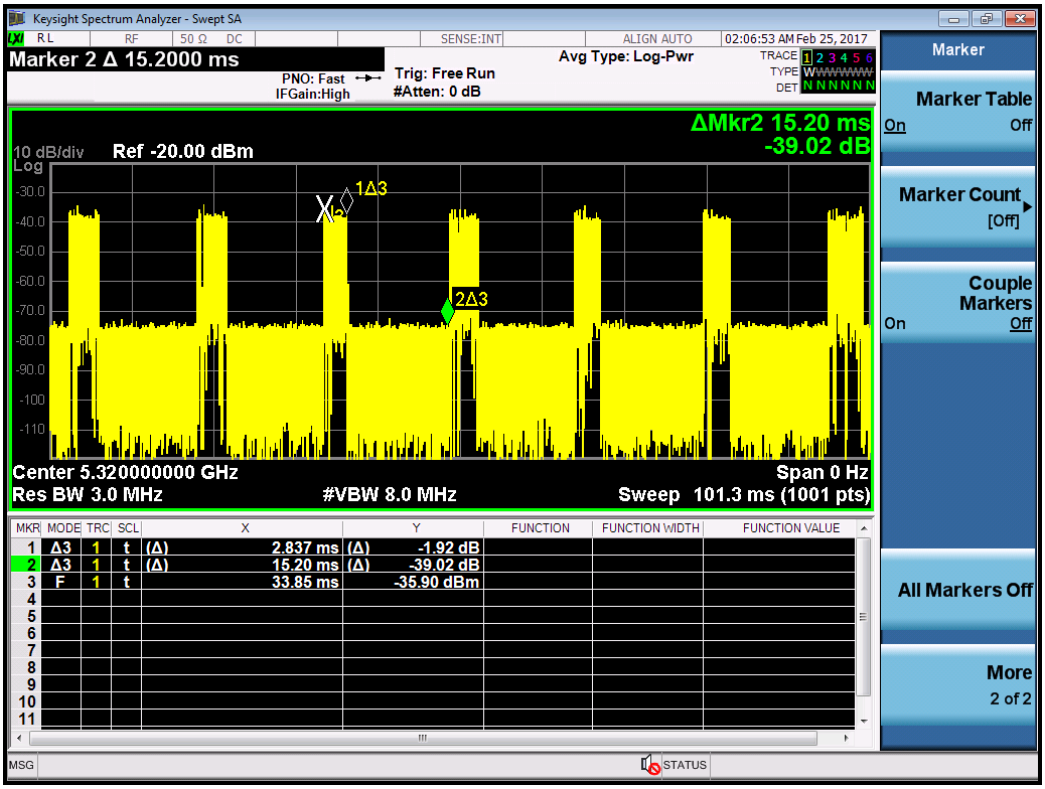
14.3.1. Test Limit

Radar Test Signal	Master (min)	Client (min)
0	> 30	> 30

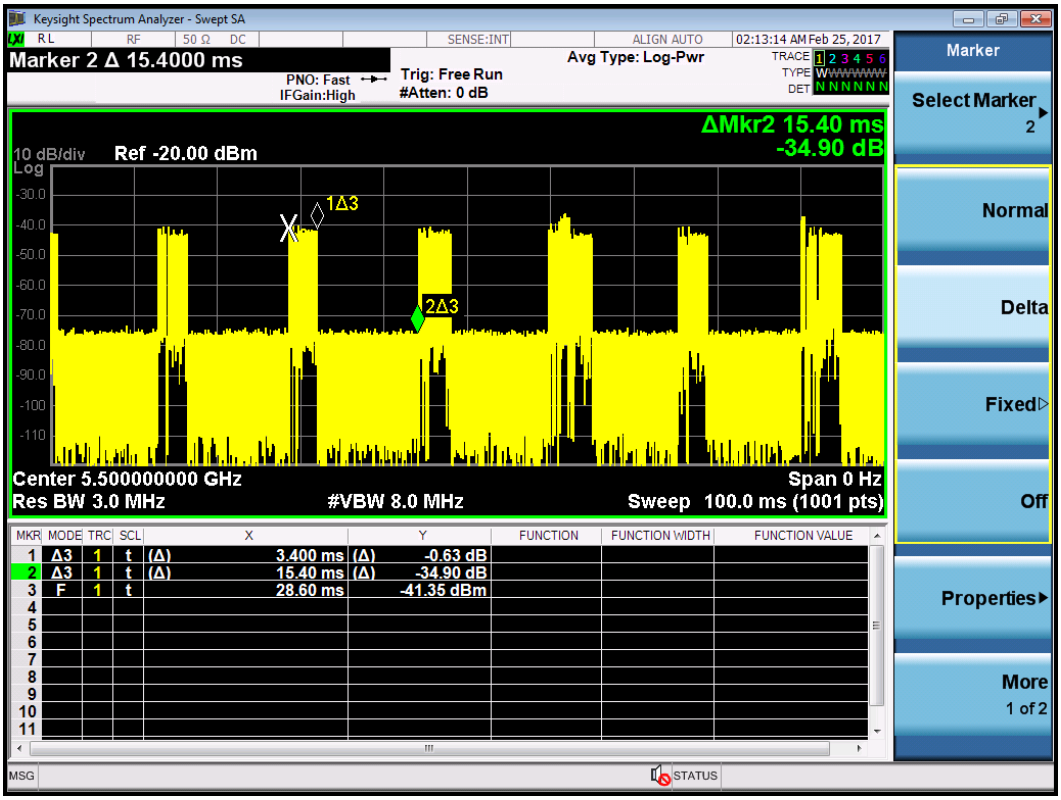
14.3.2. Channel Loading

Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time). This can be done with any appropriate channel BW and modulation type

Modulation Standard: 802.11an HT20
Time On/ (Time On + Off Time) = 2.837ms/15.2ms=18.66%

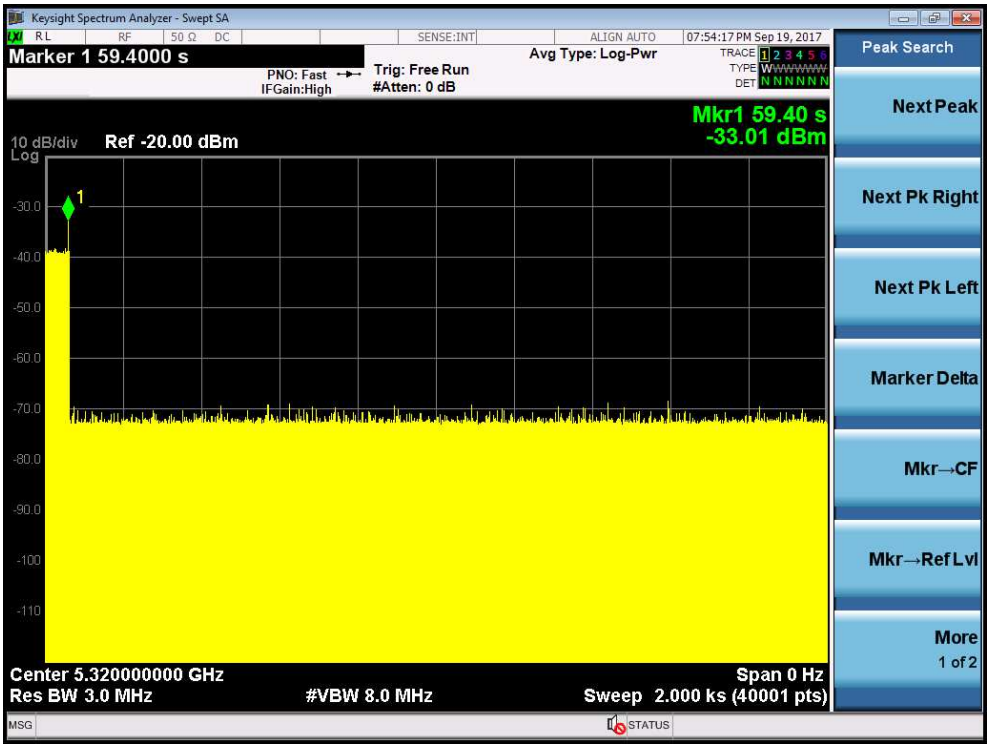


Modulation Standard: 802.11an HT40
Time On/ (Time On + Off Time) = 3.4ms/15.4ms=22.07%

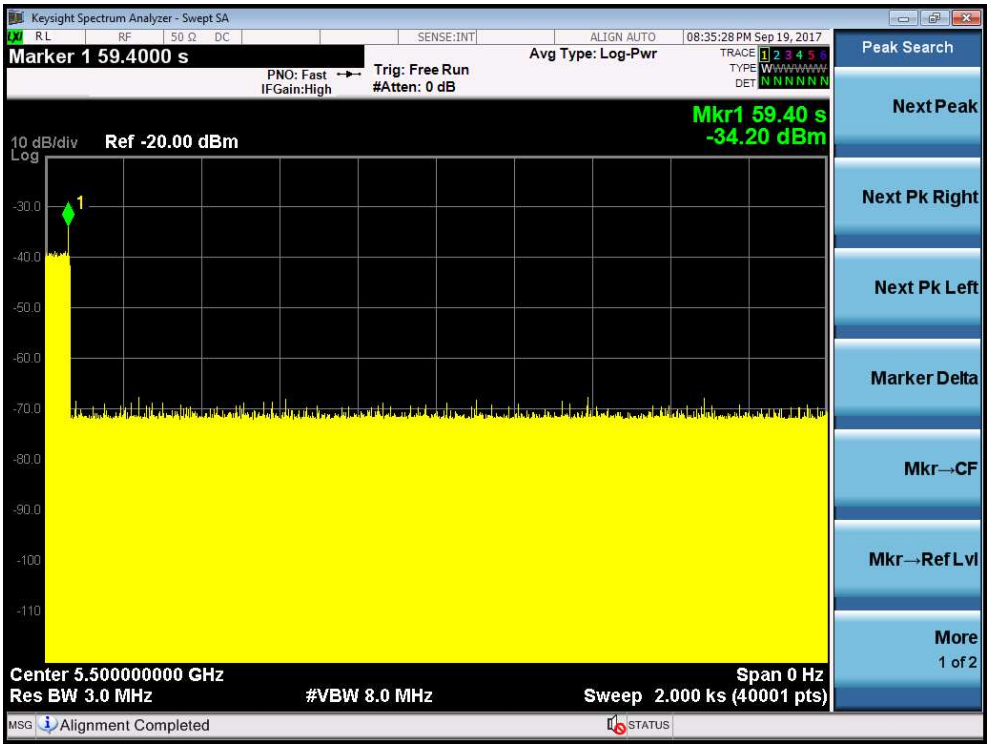


14.3.3. Test Result of Non-Occupancy Period

Modulation Standard: 802.11an HT20



Modulation Standard: 802.11an HT40



14.4. DFS Detection Threshold

DFS Detection Threshold is the level used by the DFS mechanism to detect radar interference.

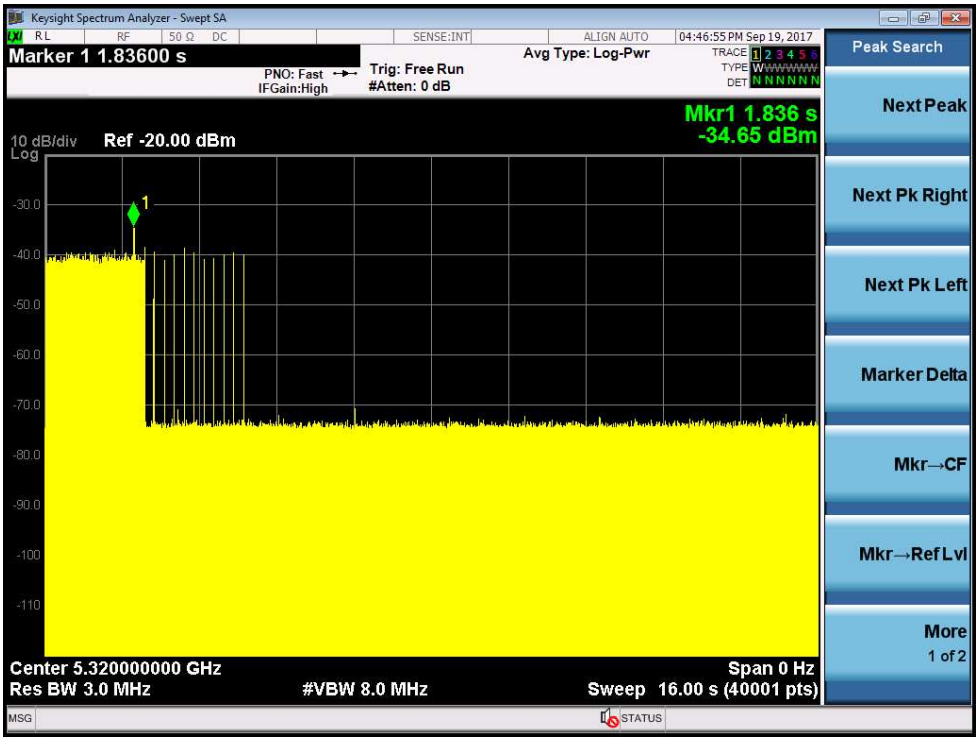
14.4.1. Test Limit

Limits Clause 4.7.2.1.2
DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

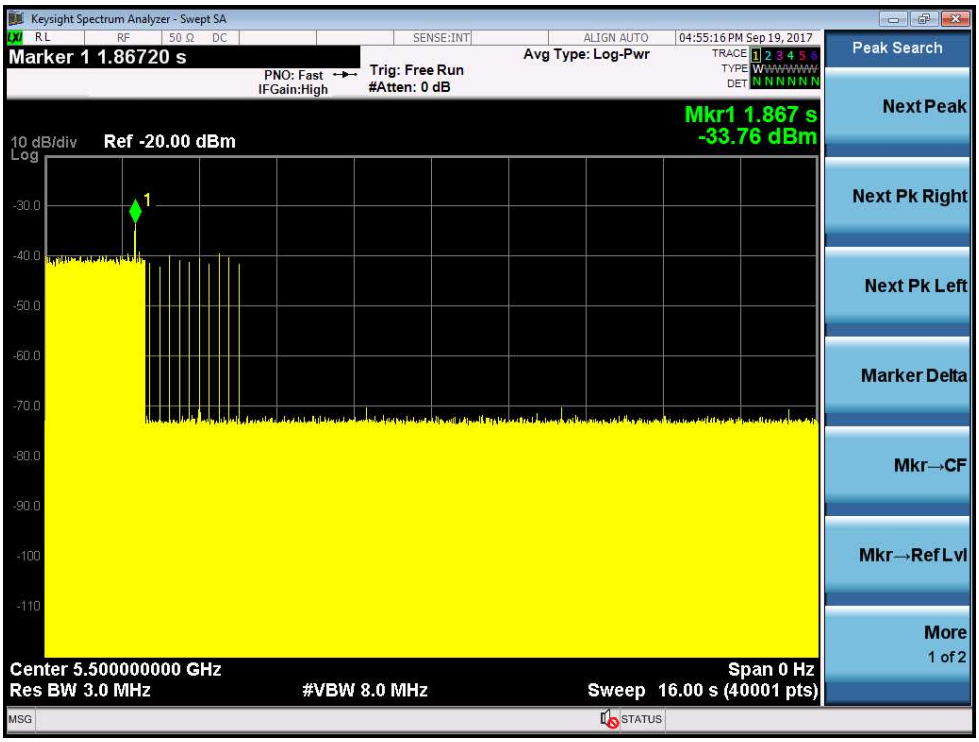
MAXIMUM TRANSMIT POWER	VALUE (SEE Note 1 and 2)
≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911	

14.4.2. Test Result of DFS Detection Threshold

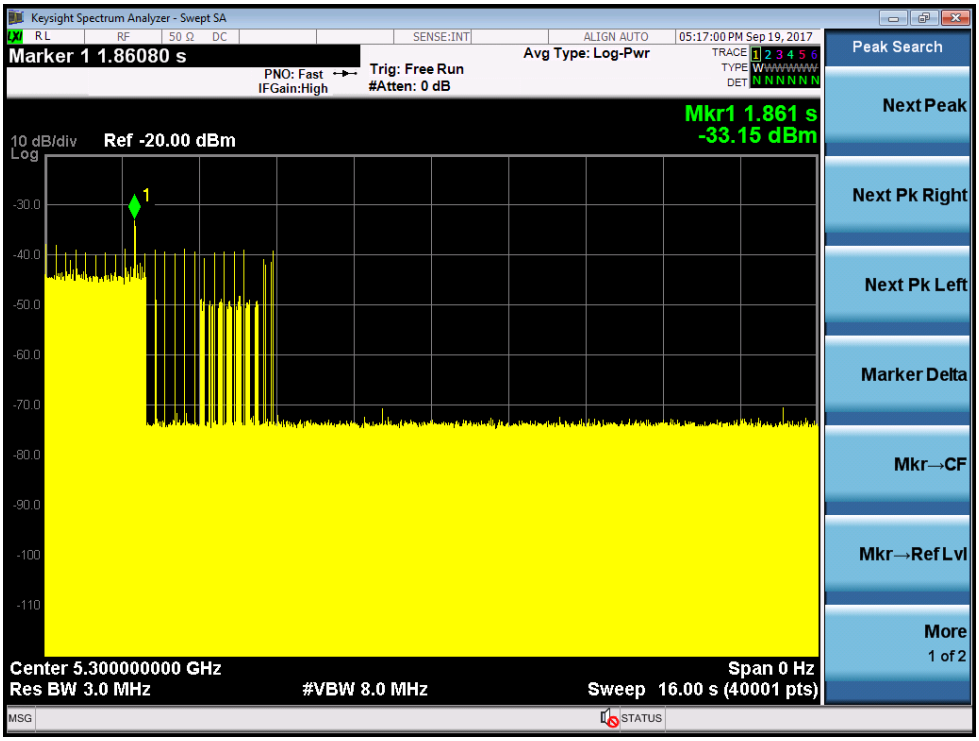
Modulation Standard: 802.11an HT20



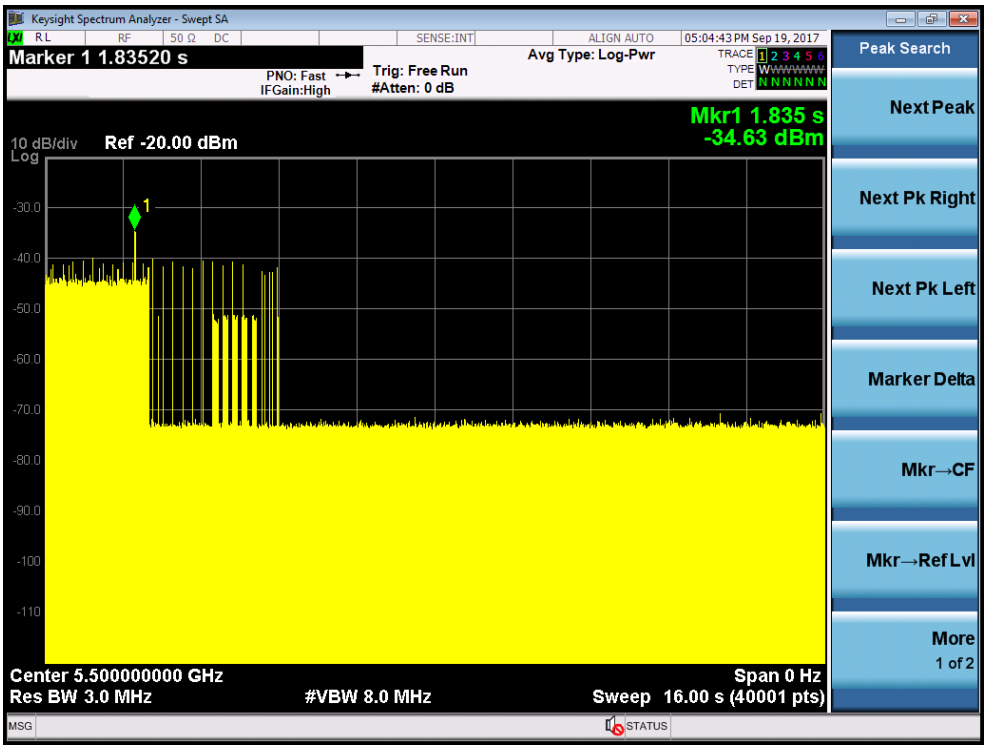
Modulation Standard: 802.11an HT20



Modulation Standard: 802.11an HT40



Modulation Standard: 802.11an HT40



14.5.Channel Availability Check

The Channel Availability Check is defined as the mechanism by which an RLAN device checks a channel for the presence of radar signals.
There shall be no transmissions by the device within the channel being checked during this process.
If no radars have been detected, the channel becomes an Available Channel valid for a period of time.
The RLAN shall only start transmissions on Available Channels.
At power-up, the RLAN is assumed to have no Available Channels.

14.5.1. Test Limit

Limits Clause 4.7.2.1.2
Table D.2: DFS requirement values

Parameter	Value
Channel Availability Check	> 60s

14.5.2. Test Result of Channel Availability Check

Not required

14.6.U-NII Detection Bandwidth

14.6.1. Test Limit

Limits Clause 4.7.2.1.2 Table D.2: DFS requirement values

Parameter	Value
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission
Note : During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

14.6.2. Test Result of U-NII Detection Bandwidth

Not required

14.7.Uniform Spreading

The UUT will select channel by random mode and remember this channel when detect radar signal, so that will select unused channel by random mode.

14.7.1. Test Result of Uniform Spreading

Not required

14.8.In-Service Monitoring

The In-Service Monitoring is defined as the process by which an RLAN monitors the Operating Channel for the presence of radar signals.

14.8.1. Test Limit

Parameter	Value
Channel Move Time	< 10 s (See Note 1)
Channel Closing Transmission Time	< 200 ms+ an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and Notes 2.)
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

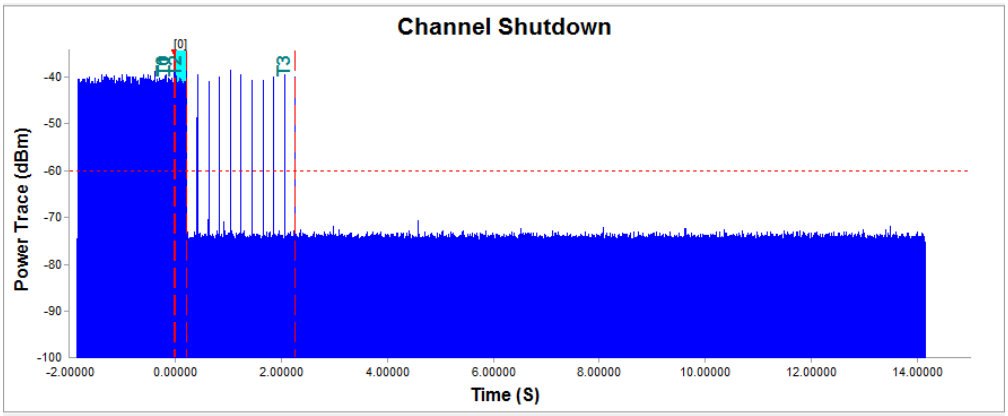
Limits Clause 4.7.2.2.2

The In-Service Monitoring shall be used to continuously monitor an Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN has started transmissions on an Operating Channel.

14.8.2. Test Result of In-Service Monitoring

Modulation Standard: 802.11an HT20

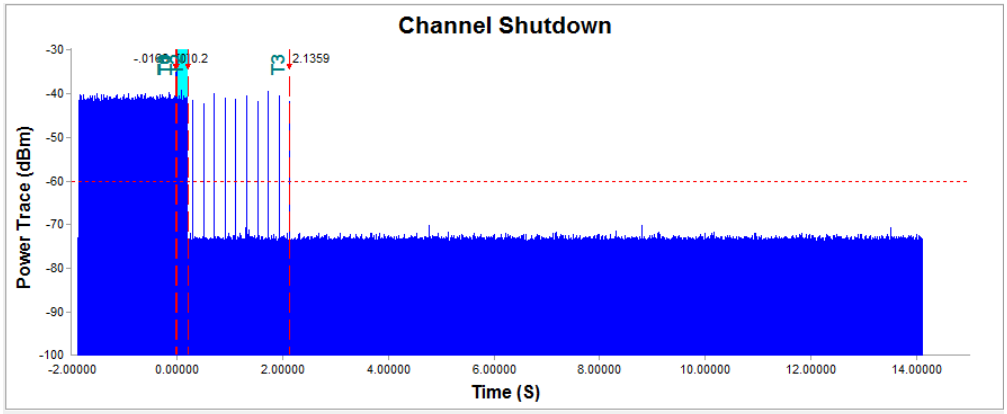


Time Index Info

T0 : -0.0168 S (Radar Injection Start)
T1 : 0.0000 S (Radar Injection Stop)
T2 : 0.2000 S (200msec Interval)
T3 : 2.2631 S (Channel Move Time)

Time Per Bin:0.39999 ms
T2~T3 Bins Over Threshold: = 27 Bins

Channel Move Time: 2.2631434 S
Channel Close Time: 0.0107997 S



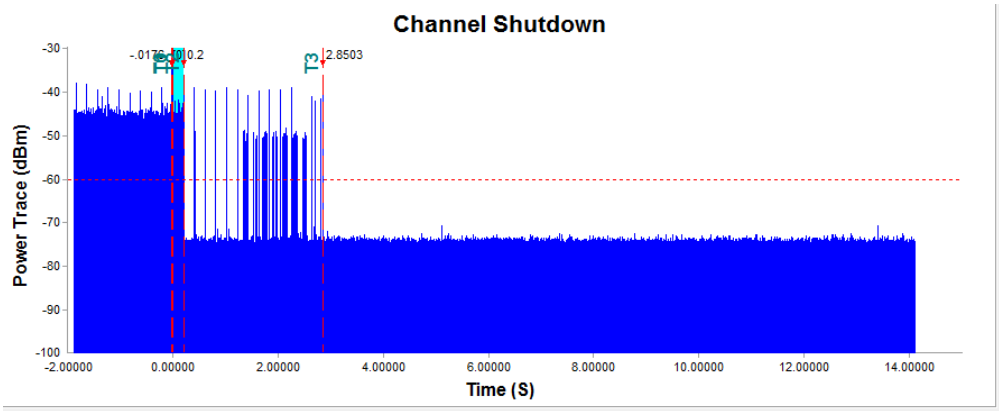
Time Index Info

T0 : -0.0168 S (Radar Injection Start)
T1 : 0.0000 S (Radar Injection Stop)
T2 : 0.2000 S (200msec Interval)
T3 : 2.1359 S (Channel Move Time)

Time Per Bin:0.39999 ms
T2~T3 Bins Over Threshold: = 11 Bins

Channel Move Time: 2.1359466 S
Channel Close Time: 0.0043999 S

Modulation Standard: 802.11an HT40

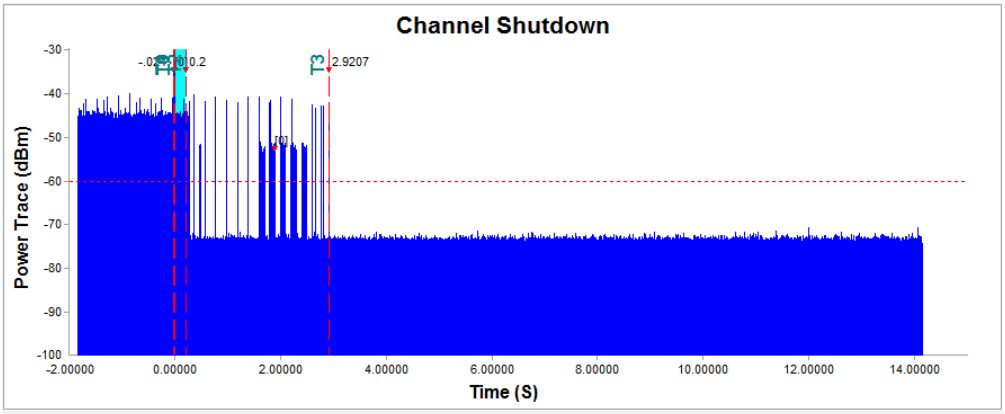


Time Index Info

T0 : -0.0176 S (Radar Injection Start)
T1 : 0.0000 S (Radar Injection Stop)
T2 : 0.2000 S (200msec Interval)
T3 : 2.8503 S (Channel Move Time)

Time Per Bin:0.39999 ms
T2~T3 Bins Over Threshold:
= 126 Bins

Channel Move Time: 2.8503287 S
Channel Close Time: 0.0503987 S



Time Index Info

T0 : -0.0240 S (Radar Injection Start)
T1 : 0.0000 S (Radar Injection Stop)
T2 : 0.2000 S (200msec Interval)
T3 : 2.9207 S (Channel Move Time)

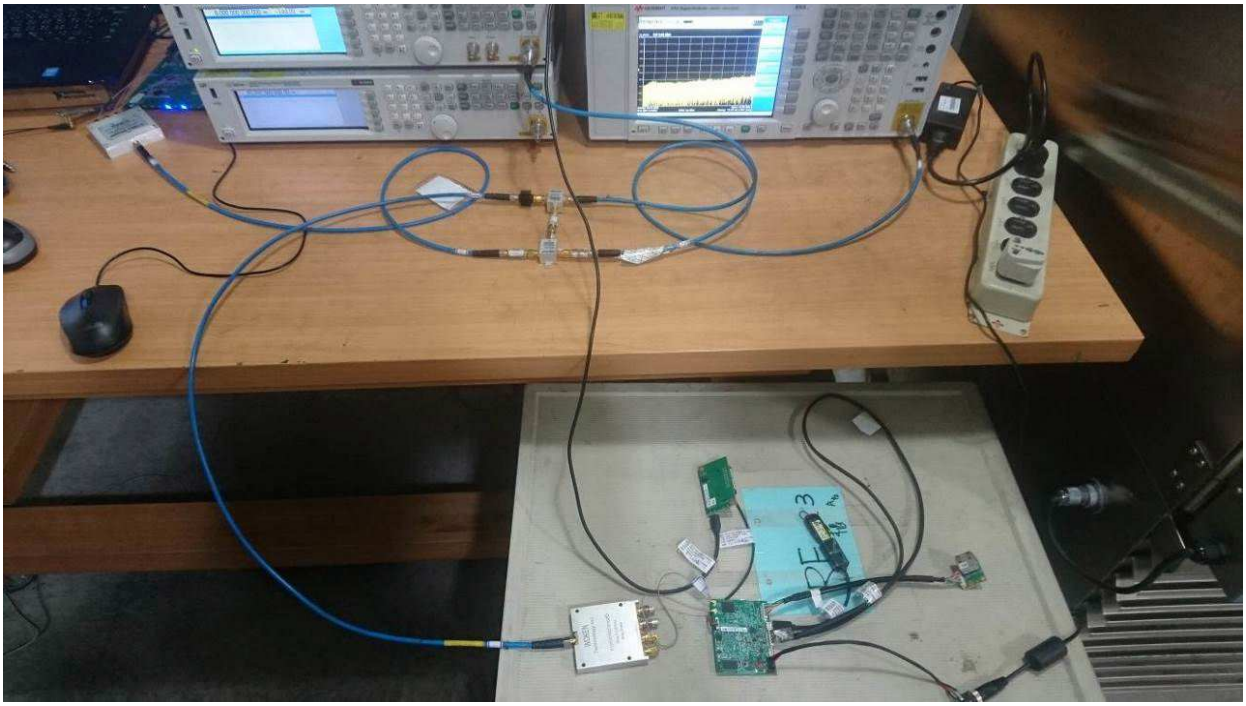
Time Per Bin:0.39999 ms
T2~T3 Bins Over Threshold:
= 119 Bins

Channel Move Time: 2.920727 S
Channel Close Time: 0.0475988 S

14.9. Statistical Performance Check

Not required

14.10. EUT Setup Photos



15. Radio Frequency Exposure

15.1. Applicable Standards

The measurements shown in this test report were made in accordance with the procedures given in

FCC Part 2 (Section 2.1091)

KDB 447498

15.2. EUT Specification

Frequency band (Operating)	☐ WLAN: 2412MHz ~ 2462MHz ☒ WLAN: 5150MHz ~ 5250MHz ☒ WLAN: 5250MHz ~ 5350MHz ☒ WLAN: 5470MHz ~ 5725MHz ☒ WLAN: 5725MHz ~ 5850MHz ☐ Bluetooth: 2402MHz ~ 2480MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A
Remark: 1. The maximum output power is 14.80dBm (0.0229mW) at 5785MHz (with numeric 5.8 antenna gain.) 2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance. 3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.	

15.3. Test Results

No non-compliance noted.

15.4.Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where E = Field strength in Volts / meter

P = Power in Watts
G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ **Equation 1**

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

15.5.Maximum Permissible Exposure

Max. output power	Band: 5150MHz ~ 5250MHz 1TX: 802.11a: 12.57 dBm (0.0137 mW) 802.11an HT20: 12.75 dBm (0.0142 mW) 802.11an HT40: 12.37 dBm (0.0131 mW) 2TX: 802.11a: 14.80 dBm (0.0229 mW) 802.11an HT20: 13.06 dBm (0.0153 mW) 802.11an HT40: 12.47 dBm (0.0134 mW)
Antenna gain (Max)	1TX: ANT A: 5.8dBi 2TX: ANT A: 5.8dBi, ANT B: 5.1dBi

Maximum Permissible Exposure

Test Mode: 1TX

Modulation Mode	Frequency band (MHz)	Max. Conducted output power (dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
802.11a	5150-5250	12.57	5.8	20	0.0137	1
	5250-5350	12.36	5.8	20	0.0130	1
	5470-5725	14.39	5.8	20	0.0208	1
	5725-5850	14.40	5.8	20	0.0208	1
802.11an HT20	5150-5250	12.27	5.8	20	0.0128	1
	5250-5350	11.37	5.8	20	0.0104	1
	5470-5725	12.75	5.8	20	0.0142	1
	5725-5850	12.03	5.8	20	0.0121	1
802.11an HT40	5150-5250	11.69	5.8	20	0.0112	1
	5250-5350	12.37	5.8	20	0.0131	1
	5470-5725	12.22	5.8	20	0.0126	1
	5725-5850	12.02	5.8	20	0.0120	1

Test Mode: 2TX

Modulation Mode	Frequency band (MHz)	Max. Conducted output power (dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
802.11a	5150-5250	11.95	5.8	20	0.0118	1
	5250-5350	12.95	5.8	20	0.0149	1
	5470-5725	14.59	5.8	20	0.0217	1
	5725-5850	14.80	5.8	20	0.0229	1
802.11an HT20	5150-5250	11.95	5.8	20	0.0118	1
	5250-5350	11.29	5.8	20	0.0102	1
	5470-5725	13.06	5.8	20	0.0153	1
	5725-5850	12.62	5.8	20	0.0138	1
802.11an HT40	5150-5250	12.26	5.8	20	0.0127	1
	5250-5350	12.47	5.8	20	0.0134	1
	5470-5725	12.39	5.8	20	0.0131	1
	5725-5850	12.39	5.8	20	0.0131	1