



Appendix B. Radiated Spurious Emission

Test Engineer :	Stan Hsieh, Ray Lee, and Tsung Lee	Temperature :	22~24°C
		Relative Humidity :	45~48%



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (10MHz) (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac VHT20 (10MHz) CH 01 2412MHz		2389.92	68.46	-5.54	74	69.06	27.23	5.39	33.22	213	184	P	H
		2390	51.94	-2.06	54	52.54	27.23	5.39	33.22	213	184	A	H
	*	2410.438	124.3	-	-	124.82	27.28	5.42	33.22	213	184	P	H
	*	2410.771	115.65	-	-	116.17	27.28	5.42	33.22	213	184	A	H
													H
													H
		2389.47	69.28	-4.72	74	69.9	27.23	5.39	33.24	251	182	P	V
		2389.92	51.23	-2.77	54	51.83	27.23	5.39	33.22	251	182	A	V
	*	2414	123.6	-	-	124.12	27.28	5.42	33.22	251	182	P	V
	*	2414	115.18	-	-	115.7	27.28	5.42	33.22	251	182	A	V
													V
													V
802.11ac VHT20 (10MHz) CH 06 2437MHz		2389.83	58.39	-15.61	74	58.99	27.23	5.39	33.22	231	183	P	H
		2389.38	47.45	-6.55	54	48.07	27.23	5.39	33.24	231	183	A	H
	*	2435.905	125.05	-	-	125.52	27.32	5.42	33.21	231	183	P	H
	*	2435.905	116.33	-	-	116.8	27.32	5.42	33.21	231	183	A	H
		2483.88	57.56	-16.44	74	57.82	27.46	5.46	33.18	231	183	P	H
		2483.6	48.1	-5.9	54	48.36	27.46	5.46	33.18	231	183	A	H
		2388.93	55.04	-18.96	74	55.66	27.23	5.39	33.24	249	179	P	V
		2390	46.19	-7.81	54	46.79	27.23	5.39	33.22	249	179	A	V
	*	2439	124.42	-	-	124.84	27.37	5.42	33.21	249	179	P	V
	*	2439	115.72	-	-	116.14	27.37	5.42	33.21	249	179	A	V
		2483.6	57.71	-16.29	74	57.97	27.46	5.46	33.18	249	179	P	V
		2483.52	46.04	-7.96	54	46.3	27.46	5.46	33.18	249	179	A	V



802.11ac VHT20 (10MHz) CH 11 2462MHz	*	2464	124.88	-	-	125.23	27.41	5.44	33.2	231	186	P	H
	*	2464	117.04	-	-	117.39	27.41	5.44	33.2	231	186	A	H
		2483.84	67.35	-6.65	74	67.61	27.46	5.46	33.18	231	186	P	H
		2484.48	53.51	-0.49	54	53.77	27.46	5.46	33.18	231	186	A	H
													H
													H
	*	2460	124.78	-	-	125.13	27.41	5.44	33.2	242	183	P	V
	*	2460.287	115.94	-	-	116.29	27.41	5.44	33.2	242	183	A	V
		2484	67.17	-6.83	74	67.43	27.46	5.46	33.18	242	183	P	V
		2483.52	51.85	-2.15	54	52.11	27.46	5.46	33.18	242	183	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (10MHz) (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 (10MHz) CH 01 2412MHz		4824	48.1	-25.9	74	69.67	31.46	7.58	60.61	100	0	P	H
													H
													H
													H
		4824	43.83	-30.17	74	65.4	31.46	7.58	60.61	100	0	P	V
													V
													V
802.11ac VHT20 (10MHz) CH 06 2437MHz		4874	47.44	-26.56	74	68.7	31.56	7.7	60.52	100	0	P	H
		7311	59.22	-14.78	74	74.48	36.18	9.49	60.93	203	346	P	H
		7311	52.9	-1.1	54	68.16	36.18	9.49	60.93	203	346	A	H
													H
		4874	48.4	-25.6	74	69.66	31.56	7.7	60.52	100	0	P	V
		7311	54.17	-19.83	74	69.43	36.18	9.49	60.93	309	11	P	V
		7311	48.91	-5.09	54	64.17	36.18	9.49	60.93	309	11	A	V
802.11ac VHT20 (10MHz) CH 11 2462MHz													V
		4924	51.3	-22.7	74	72.13	31.66	7.93	60.42	100	0	P	H
		7386	60.53	-13.47	74	75.82	36.37	9.53	61.19	235	348	P	H
		7386	50.79	-3.21	54	66.08	36.37	9.53	61.19	235	348	A	H
													H
		4924	52.24	-21.76	74	73.07	31.66	7.93	60.42	100	0	P	V
		7386	54.78	-19.22	74	70.07	36.37	9.53	61.19	281	6	P	V
Remark		7386	47.57	-6.43	54	62.86	36.37	9.53	61.19	281	6	A	V
													V
1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 01 2412MHz		2389.47	65.05	-8.95	74	65.67	27.23	5.39	33.24	234	181	P	H
		2390	53.67	-0.33	54	54.27	27.23	5.39	33.22	234	181	A	H
	*	2414	115.59	-	-	116.11	27.28	5.42	33.22	234	181	P	H
	*	2414	108.08	-	-	108.6	27.28	5.42	33.22	234	181	A	H
													H
													H
		2389.38	64.18	-9.82	74	64.8	27.23	5.39	33.24	251	182	P	V
		2390	53.54	-0.46	54	54.14	27.23	5.39	33.22	251	182	A	V
	*	2414	114.89	-	-	115.41	27.28	5.42	33.22	251	182	P	V
	*	2414	107.4	-	-	107.92	27.28	5.42	33.22	251	182	A	V
													V
													V
802.11ac VHT20 CH 06 2437MHz		2389.47	58.05	-15.95	74	58.67	27.23	5.39	33.24	233	184	P	H
		2389.47	48.23	-5.77	54	48.85	27.23	5.39	33.24	233	184	A	H
	*	2439	121.22	-	-	121.64	27.37	5.42	33.21	233	184	P	H
	*	2439	113.57	-	-	113.99	27.37	5.42	33.21	233	184	A	H
		2484.08	60.49	-13.51	74	60.75	27.46	5.46	33.18	233	184	P	H
		2483.96	50.23	-3.77	54	50.49	27.46	5.46	33.18	233	184	A	H
		2387.94	55.86	-18.14	74	56.48	27.23	5.39	33.24	248	183	P	V
		2389.92	47.18	-6.82	54	47.78	27.23	5.39	33.22	248	183	A	V
	*	2435	121.39	-	-	121.86	27.32	5.42	33.21	248	183	P	V
	*	2435	112.76	-	-	113.23	27.32	5.42	33.21	248	183	A	V
		2485.64	56.87	-17.13	74	57.13	27.46	5.46	33.18	248	183	P	V
		2483.6	46.83	-7.17	54	47.09	27.46	5.46	33.18	248	183	A	V



802.11ac VHT20 CH 11 2462MHz	*	2464	112.62	-	-	112.97	27.41	5.44	33.2	230	184	P	H
	*	2464	105.24	-	-	105.59	27.41	5.44	33.2	230	184	A	H
		2484.52	62.99	-11.01	74	63.25	27.46	5.46	33.18	230	184	P	H
		2483.56	52.32	-1.68	54	52.58	27.46	5.46	33.18	230	184	A	H
													H
													H
	*	2460	112.52	-	-	112.87	27.41	5.44	33.2	246	180	P	V
	*	2460	104.24	-	-	104.59	27.41	5.44	33.2	246	180	A	V
		2483.76	62.3	-11.7	74	62.56	27.46	5.46	33.18	246	180	P	V
		2483.6	50.67	-3.33	54	50.93	27.46	5.46	33.18	246	180	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT20 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT20 CH 01 2412MHz		4824	42.38	-31.62	74	63.95	31.46	7.58	60.61	100	0	P	H
													H
													H
													H
		4824	36.81	-37.19	74	58.38	31.46	7.58	60.61	100	0	P	V
													V
													V
													V
802.11ac VHT20 CH 06 2437MHz		4874	46.27	-27.73	74	67.53	31.56	7.7	60.52	100	0	P	H
		7311	56.19	-17.81	74	71.45	36.18	9.49	60.93	207	345	P	H
		7311	48	-6	54	63.26	36.18	9.49	60.93	207	345	A	H
													H
		4874	44.43	-29.57	74	65.69	31.56	7.7	60.52	100	0	P	V
		7311	56.07	-17.93	74	71.33	36.18	9.49	60.93	290	6	P	V
		7311	45.49	-8.51	54	60.75	36.18	9.49	60.93	290	6	A	V
													V
802.11ac VHT20 CH 11 2462MHz		4924	36.78	-37.22	74	57.61	31.66	7.93	60.42	100	0	P	H
		7386	41.15	-32.85	74	56.44	36.37	9.53	61.19	100	0	P	H
													H
													H
		4924	36.49	-37.51	74	57.32	31.66	7.93	60.42	100	0	P	V
		7386	41.18	-32.82	74	56.47	36.37	9.53	61.19	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT40 CH 03 2422MHz		2390	61.93	-12.07	74	62.53	27.23	5.39	33.22	218	180	P	H
		2390	52.94	-1.06	54	53.54	27.23	5.39	33.22	218	180	A	H
	*	2420.541	108.33	-	-	108.8	27.32	5.42	33.21	218	180	P	H
	*	2420	100.04	-	-	100.51	27.32	5.42	33.21	218	180	A	H
		2483.8	56.38	-17.62	74	56.64	27.46	5.46	33.18	218	180	P	H
		2486.48	47.22	-6.78	54	47.48	27.46	5.46	33.18	218	180	A	H
		2390	63.16	-10.84	74	63.76	27.23	5.39	33.22	250	182	P	V
		2389.2	53.93	-0.07	54	54.55	27.23	5.39	33.24	250	182	A	V
	*	2424	107.46	-	-	107.93	27.32	5.42	33.21	250	182	P	V
	*	2424	99.87	-	-	100.34	27.32	5.42	33.21	250	182	A	V
		2496.92	52.98	-21.02	74	53.19	27.5	5.46	33.17	250	182	P	V
		2486.2	44.39	-9.61	54	44.65	27.46	5.46	33.18	250	182	A	V
802.11ac VHT40 CH 06 2437MHz		2389.56	58.98	-15.02	74	59.6	27.23	5.39	33.24	230	183	P	H
		2389.92	50.67	-3.33	54	51.27	27.23	5.39	33.22	230	183	A	H
	*	2435	111.52	-	-	111.99	27.32	5.42	33.21	230	183	P	H
	*	2435	104.32	-	-	104.79	27.32	5.42	33.21	230	183	A	H
		2485.24	61.44	-12.56	74	61.7	27.46	5.46	33.18	230	183	P	H
		2483.6	52.38	-1.62	54	52.64	27.46	5.46	33.18	230	183	A	H
		2388.03	58.48	-15.52	74	59.1	27.23	5.39	33.24	241	183	P	V
		2389.83	49.78	-4.22	54	50.38	27.23	5.39	33.22	241	183	A	V
	*	2439	111.93	-	-	112.35	27.37	5.42	33.21	241	183	P	V
	*	2439	104.06	-	-	104.48	27.37	5.42	33.21	241	183	A	V
		2483.72	62.73	-11.27	74	62.99	27.46	5.46	33.18	241	183	P	V
		2483.72	52.64	-1.36	54	52.9	27.46	5.46	33.18	241	183	A	V



802.11ac VHT40 CH 09 2452MHz		2389.56	53.6	-20.4	74	54.22	27.23	5.39	33.24	226	182	P	H
		2389.83	44.32	-9.68	54	44.92	27.23	5.39	33.22	226	182	A	H
	*	2454	105.75	-	-	106.1	27.41	5.44	33.2	226	182	P	H
	*	2454	98.43	-	-	98.78	27.41	5.44	33.2	226	182	A	H
		2483.92	64.28	-9.72	74	64.54	27.46	5.46	33.18	226	182	P	H
		2483.68	53.17	-0.83	54	53.43	27.46	5.46	33.18	226	182	A	H
		2388.84	52.6	-21.4	74	53.22	27.23	5.39	33.24	242	181	P	V
		2389.83	44.07	-9.93	54	44.67	27.23	5.39	33.22	242	181	A	V
	*	2454	106.12	-	-	106.47	27.41	5.44	33.2	242	181	P	V
	*	2454	97.93	-	-	98.28	27.41	5.44	33.2	242	181	A	V
		2483.52	62.94	-11.06	74	63.2	27.46	5.46	33.18	242	181	P	V
		2483.56	52.31	-1.69	54	52.57	27.46	5.46	33.18	242	181	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11ac VHT40 (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ac VHT40 CH 03 2422MHz		4844	35.83	-38.17	74	57.22	31.49	7.7	60.58	100	0	P	H
		7266	40.42	-33.58	74	55.68	36.11	9.46	60.83	100	0	P	H
													H
													H
		4844	35.48	-38.52	74	56.87	31.49	7.7	60.58	100	0	P	V
		7266	40.95	-33.05	74	56.21	36.11	9.46	60.83	100	0	P	V
													V
													V
802.11ac VHT40 CH 06 2437MHz		4874	39.3	-34.7	74	60.56	31.56	7.7	60.52	100	0	P	H
		7311	46.2	-27.8	74	61.46	36.18	9.49	60.93	100	0	P	H
													H
													H
		4874	35.72	-38.28	74	56.98	31.56	7.7	60.52	100	0	P	V
		7311	43.56	-30.44	74	58.82	36.18	9.49	60.93	100	0	P	V
													V
													V
802.11ac VHT40 CH 09 2452MHz		4902	36.1	-37.9	74	57.11	31.63	7.82	60.46	100	0	P	H
		7356	41.11	-32.89	74	56.39	36.3	9.51	61.09	100	0	P	H
													H
													H
		4902	36.15	-37.85	74	57.16	31.63	7.82	60.46	100	0	P	V
		7356	41.97	-32.03	74	57.25	36.3	9.51	61.09	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11ac VHT40 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11ac VHT40 LF		125.04	37.56	-5.94	43.5	51.09	17.8	1.33	32.66			P	H
		129.9	36.96	-6.54	43.5	50.29	18	1.33	32.66			P	H
		214.95	38.58	-4.92	43.5	53.64	16.05	1.62	32.73	100	133	P	H
		325.2	35.7	-10.3	46	46.27	20.25	1.94	32.76			P	H
		400.1	38.83	-7.17	46	47.32	22.22	2.13	32.84			P	H
		724.9	33.15	-12.85	46	36.21	26.99	2.91	32.96			P	H
													H
													H
													H
													H
													H
													H
		125.04	34.89	-8.61	43.5	48.42	17.8	1.33	32.66			P	V
		200.1	33.87	-9.63	43.5	49.32	15.8	1.48	32.73			P	V
		214.95	37.1	-6.4	43.5	52.16	16.05	1.62	32.73	100	162	P	V
		328	32.92	-13.08	46	43.4	20.34	1.94	32.76			P	V
		400.1	36.31	-9.69	46	44.8	22.22	2.13	32.84			P	V
		957.3	32.04	-13.96	46	30.22	30.21	3.29	31.68			P	V
													V
													V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.