Appendix B. Radiated Spurious Emission

Test Engineer :	Stan Hsieh and Karl Hou	Temperature :	24~25°C
		Relative Humidity :	53~54%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2389.83	57.52	-16.48	74	58.12	27.23	5.39	33.22	147	260	P	H
		2390	51.06	-2.94	54	51.66	27.23	5.39	33.22	147	260	A	H
	*	2412	109.88	-	-	110.4	27.28	5.42	33.22	147	260	P	H
	*	2412	107.39	-	-	107.91	27.28	5.42	33.22	147	260	A	H
													H
													H
		2389.83	55.09	-18.91	74	55.69	27.23	5.39	33.22	375	54	P	V
		2389.74	46.12	-7.88	54	46.74	27.23	5.39	33.24	375	54	A	V
	*	2412	104.44	-	-	104.96	27.28	5.42	33.22	375	54	P	V
	*	2412	102.02	-	-	102.54	27.28	5.42	33.22	375	54	A	V
													V
													V
802.11b CH 06 2437MHz		2359.5	53.06	-20.94	74	53.84	27.14	5.33	33.25	136	261	P	H
		2389.56	42.86	-11.14	54	43.48	27.23	5.39	33.24	136	261	A	H
	*	2437	108.12	-	-	108.54	27.37	5.42	33.21	136	261	P	H
	*	2437	105.14	-	-	105.56	27.37	5.42	33.21	136	261	A	H
		2485.84	52.92	-21.08	74	53.18	27.46	5.46	33.18	136	261	P	H
		2485	42.86	-11.14	54	43.12	27.46	5.46	33.18	136	261	A	H
		2378.4	53.28	-20.72	74	53.94	27.19	5.39	33.24	100	87	P	V
		2387.58	42.55	-11.45	54	43.17	27.23	5.39	33.24	100	87	A	V
	*	2437	100.78	-	-	101.2	27.37	5.42	33.21	100	87	P	V
	*	2437	98.13	-	-	98.55	27.37	5.42	33.21	100	87	A	V
		2499.88	53.11	-20.89	74	53.32	27.5	5.46	33.17	100	87	P	V
		2484.16	42.83	-11.17	54	43.09	27.46	5.46	33.18	100	87	A	V

802.11b CH 11 2462MHz	*	2460	108.17	-	-	108.52	27.41	5.44	33.2	137	98	P	H
	*	2460	105.59	-	-	105.94	27.41	5.44	33.2	137	98	A	H
		2493.52	53.43	-20.57	74	53.64	27.5	5.46	33.17	137	98	P	H
		2483.52	43.7	-10.3	54	43.96	27.46	5.46	33.18	137	98	A	H
													H
													H
	*	2460	102	-	-	102.35	27.41	5.44	33.2	371	52	P	V
	*	2460	99.05	-	-	99.4	27.41	5.44	33.2	371	52	A	V
		2483.64	53.66	-20.34	74	53.92	27.46	5.46	33.18	371	52	P	V
		2484.36	42.83	-11.17	54	43.09	27.46	5.46	33.18	371	52	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 802.11b (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11b CH 01 2412MHz		4824	54.9	-19.1	74	76.47	31.46	7.58	60.61	102	251	P	H
		4824	52.76	-1.24	54	74.33	31.46	7.58	60.61	102	251	A	H
													H
													H
		4824	48.91	-25.09	74	70.48	31.46	7.58	60.61	100	0	P	V
													V
													V
													V
802.11b CH 06 2437MHz		4872	47.55	-26.45	74	68.81	31.56	7.7	60.52	100	0	P	H
		7308	43.47	-30.53	74	58.73	36.18	9.49	60.93	100	0	P	H
													H
													H
		4872	44.67	-29.33	74	65.93	31.56	7.7	60.52	100	0	P	V
		7308	42.78	-31.22	74	58.04	36.18	9.49	60.93	100	0	P	V
													V
													V
802.11b CH 11 2462MHz		4926	53.92	-20.08	74	74.75	31.66	7.93	60.42	111	271	P	H
		4926	52.38	-1.62	54	73.21	31.66	7.93	60.42	111	271	A	H
		7386	41.98	-32.02	74	57.27	36.37	9.53	61.19	100	0	P	H
													H
		4926	48.36	-25.64	74	69.19	31.66	7.93	60.42	100	0	P	V
		7386	41.98	-32.02	74	57.27	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 802.11g (Band Edge @ 3m)

WIFI Ant. 1	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)
802.11g CH 01 2412MHz		2389.02	65.55	-8.45	74	66.17	27.23	5.39	33.24	100	263	P	H
		2390	52.4	-1.6	54	53	27.23	5.39	33.22	100	263	A	H
	*	2414	106.21	-	-	106.73	27.28	5.42	33.22	100	263	P	H
	*	2414	97.48	-	-	98	27.28	5.42	33.22	100	263	A	H
													H
													H
		2390	60.42	-13.58	74	61.02	27.23	5.39	33.22	375	23	P	V
		2390	47.39	-6.61	54	47.99	27.23	5.39	33.22	375	23	A	V
	*	2414	100.15	-	-	100.67	27.28	5.42	33.22	375	23	P	V
	*	2414	92.45	-	-	92.97	27.28	5.42	33.22	375	23	A	V
													V
													V
802.11g CH 06 2437MHz		2387.94	56.12	-17.88	74	56.74	27.23	5.39	33.24	125	264	P	H
		2384.7	44.88	-9.12	54	45.54	27.19	5.39	33.24	125	264	A	H
	*	2439	108.88	-	-	109.3	27.37	5.42	33.21	125	264	P	H
	*	2439	101.27	-	-	101.69	27.37	5.42	33.21	125	264	A	H
		2486.68	53.98	-20.02	74	54.24	27.46	5.46	33.18	125	264	P	H
		2483.52	43.33	-10.67	54	43.59	27.46	5.46	33.18	125	264	A	H
		2339.25	53.34	-20.66	74	54.16	27.1	5.33	33.25	105	87	P	V
		2385.06	43.23	-10.77	54	43.89	27.19	5.39	33.24	105	87	A	V
	*	2439	102.5	-	-	102.92	27.37	5.42	33.21	105	87	P	V
	*	2439	95.13	-	-	95.55	27.37	5.42	33.21	105	87	A	V
		2488.88	52.86	-21.14	74	53.08	27.5	5.46	33.18	105	87	P	V
		2485.28	43.21	-10.79	54	43.47	27.46	5.46	33.18	105	87	A	V

802.11g CH 11 2462MHz	*	2460	109.13	-	-	109.48	27.41	5.44	33.2	100	112	P	H
	*	2460	101.41	-	-	101.76	27.41	5.44	33.2	100	112	A	H
		2483.56	70.1	-3.9	74	70.36	27.46	5.46	33.18	100	112	P	H
		2483.52	53.29	-0.71	54	53.55	27.46	5.46	33.18	100	112	A	H
													H
													H
	*	2460	101.6	-	-	101.95	27.41	5.44	33.2	363	345	P	V
	*	2460	94.32	-	-	94.67	27.41	5.44	33.2	363	345	A	V
		2483.84	59.09	-14.91	74	59.35	27.46	5.46	33.18	363	345	P	V
		2483.52	45.8	-8.2	54	46.06	27.46	5.46	33.18	363	345	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 802.11g (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11g CH 01 2412MHz		4818	40.96	-33.04	74	62.53	31.46	7.58	60.61	100	0	P	H
													H
													H
													H
		4830	43.61	-30.39	74	65.18	31.46	7.58	60.61	100	0	P	V
													V
													V
													V
802.11g CH 06 2437MHz		4872	42.67	-31.33	74	63.93	31.56	7.7	60.52	100	0	P	H
		7308	43.04	-30.96	74	58.3	36.18	9.49	60.93	100	0	P	H
													H
													H
		4872	40.11	-33.89	74	61.37	31.56	7.7	60.52	100	0	P	V
		7308	42.32	-31.68	74	57.58	36.18	9.49	60.93	100	0	P	V
													V
													V
802.11g CH 11 2462MHz		4932	46.61	-27.39	74	67.44	31.66	7.93	60.42	100	0	P	H
		7386	41.08	-32.92	74	56.37	36.37	9.53	61.19	100	0	P	H
													H
													H
		4926	43.01	-30.99	74	63.84	31.66	7.93	60.42	100	0	P	V
		7386	41.24	-32.76	74	56.53	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 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	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)
		2389.92	65.87	-8.13	74	66.47	27.23	5.39	33.22	100	114	P	H
		2390	53.54	-0.46	54	54.14	27.23	5.39	33.22	100	114	A	H
	*	2413	106	-	-	106.52	27.28	5.42	33.22	100	114	P	H
	*	2413	97.94	-	-	98.46	27.28	5.42	33.22	100	114	A	H
802.11n													H
HT20													H
CH 01		2389.47	59.69	-14.31	74	60.31	27.23	5.39	33.24	100	295	P	V
2412MHz		2390	47.71	-6.29	54	48.31	27.23	5.39	33.22	100	295	A	V
	*	2414	98.33	-	-	98.85	27.28	5.42	33.22	100	295	P	V
	*	2414	90.36	-	-	90.88	27.28	5.42	33.22	100	295	A	V
													V
													V
		2389.11	56.77	-17.23	74	57.39	27.23	5.39	33.24	100	99	P	H
		2385.33	45.35	-8.65	54	46.01	27.19	5.39	33.24	100	99	A	H
	*	2439	106.62	-	-	107.04	27.37	5.42	33.21	100	99	P	H
	*	2439	99.13	-	-	99.55	27.37	5.42	33.21	100	99	A	H
802.11n		2485.24	53.77	-20.23	74	54.03	27.46	5.46	33.18	100	99	P	H
HT20		2483.52	43.28	-10.72	54	43.54	27.46	5.46	33.18	100	99	A	H
CH 06		2329.53	53.42	-20.58	74	54.3	27.05	5.33	33.26	100	346	P	V
2437MHz		2385.51	43.19	-10.81	54	43.81	27.23	5.39	33.24	100	346	A	V
	*	2439	100.4	-	-	100.82	27.37	5.42	33.21	100	346	P	V
	*	2439	92.97	-	-	93.39	27.37	5.42	33.21	100	346	A	V
		2494.24	53.4	-20.6	74	53.61	27.5	5.46	33.17	100	346	P	V
		2491.28	43.27	-10.73	54	43.49	27.5	5.46	33.18	100	346	A	V

	*	2460	107.92	-	-	108.27	27.41	5.44	33.2	137	122	P	H
	*	2460	100.24	-	-	100.59	27.41	5.44	33.2	137	122	A	H
		2484.12	68.07	-5.93	74	68.33	27.46	5.46	33.18	137	122	P	H
		2483.6	50.68	-3.32	54	50.94	27.46	5.46	33.18	137	122	A	H
802.11n													H
HT20													H
CH 11	*	2460	100.07	-	-	100.42	27.41	5.44	33.2	100	84	P	V
2462MHz	*	2460	92.48	-	-	92.83	27.41	5.44	33.2	100	84	A	V
		2483.56	60.11	-13.89	74	60.37	27.46	5.46	33.18	100	84	P	V
		2483.6	46.02	-7.98	54	46.28	27.46	5.46	33.18	100	84	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 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	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)
		4824	41.53	-32.47	74	63.1	31.46	7.58	60.61	100	0	P	H
													H
802.11n													H
HT20													H
CH 01		4822	38.58	-35.42	74	60.15	31.46	7.58	60.61	100	0	P	V
2412MHz													V
													V
													V
		4874	41.44	-32.56	74	62.7	31.56	7.7	60.52	100	0	P	H
		7308	43.15	-30.85	74	58.41	36.18	9.49	60.93	100	0	P	H
802.11n													H
HT20													H
CH 06		4874	38.91	-35.09	74	60.17	31.56	7.7	60.52	100	0	P	V
2437MHz		7308	41.95	-32.05	74	57.21	36.18	9.49	60.93	100	0	P	V
													V
													V
		4926	46.74	-27.26	74	67.57	31.66	7.93	60.42	100	0	P	H
		7386	42.39	-31.61	74	57.68	36.37	9.53	61.19	100	0	P	H
802.11n													H
HT20													H
CH 11		4926	41.59	-32.41	74	62.42	31.66	7.93	60.42	100	0	P	V
2462MHz		7386	42.61	-31.39	74	57.9	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.

Emission below 1GHz

2.4GHz WIFI 802.11b (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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		75.09	30.89	-9.11	40	55.38	7.29	0.93	32.71	100	256	P	H
		176.61	27.68	-15.82	43.5	49.26	9.65	1.48	32.71			P	H
		293.79	35.01	-10.99	46	52.18	13.68	1.88	32.73			P	H
		307	29.88	-16.12	46	46.72	14.02	1.88	32.74			P	H
		412	24.53	-21.47	46	38.52	16.7	2.16	32.85			P	H
		720.7	29.01	-16.99	46	38.15	21.01	2.82	32.97			P	H
													H
													H
													H
													H
2.4GHz													H
802.11n													H
HT20		43.23	33.93	-6.07	40	53.81	12.26	0.65	32.79			P	V
LF		126.39	31.45	-12.05	43.5	50.82	11.96	1.33	32.66			P	V
		200.64	32.81	-10.69	43.5	53.93	10.13	1.48	32.73			P	V
		357.4	40.07	-5.93	46	55.52	15.4	1.94	32.79	125	87	P	V
		423.9	31.95	-14.05	46	45.77	16.88	2.16	32.86			P	V
		752.9	32.36	-13.64	46	40.75	21.63	2.91	32.93			P	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	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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".