



Appendix A. Radiated Spurious Emission

Test Engineer :	Stan Hsieh	Temperature :	22~23°C
		Relative Humidity :	45~47%

<Ant. 1>

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		2389.47	58.14	-15.86	74	58.76	27.23	5.39	33.24	305	203	P	H
		2389.92	46.2	-7.8	54	46.8	27.23	5.39	33.22	305	203	A	H
	*	2410	105.8	-	-	106.32	27.28	5.42	33.22	305	203	P	H
	*	2410	98.11	-	-	98.63	27.28	5.42	33.22	305	203	A	H
													H
													H
		2388.57	65.3	-8.7	74	65.92	27.23	5.39	33.24	114	219	P	V
		2390	51.97	-2.03	54	52.57	27.23	5.39	33.22	114	219	A	V
	*	2410	113.12	-	-	113.64	27.28	5.42	33.22	114	219	P	V
	*	2410	105.52	-	-	106.04	27.28	5.42	33.22	114	219	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		4824	36.89	-37.11	74	58.46	31.46	7.58	60.61	100	0	P	H
													H
													H
													H
		4824	37.26	-36.74	74	58.83	31.46	7.58	60.61	100	0	P	V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1 GHz

2.4GHz WIFI 802.11g (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)
2.4GHz 802.11g LF		78.6	27.03	-12.97	40	45.13	13.66	0.93	32.69			P	H
		94.26	29.16	-14.34	43.5	45.05	15.62	1.14	32.65			P	H
		188.76	30.77	-12.73	43.5	46.42	15.59	1.48	32.72	102	63	P	H
		300.7	22.79	-23.21	46	33.91	19.73	1.88	32.73			P	H
		489	23.59	-22.41	46	30.2	23.97	2.33	32.91			P	H
		943.3	31.15	-14.85	46	29.85	29.85	3.29	31.84			P	H
													H
													H
													H
													H
													H
													H
		37.29	32.08	-7.92	40	42.62	21.62	0.65	32.81	100	0	P	V
		78.6	29.55	-10.45	40	47.65	13.66	0.93	32.69			P	V
		94.26	28.72	-14.78	43.5	44.61	15.62	1.14	32.65			P	V
		373.5	20.95	-25.05	46	29.87	21.76	2.13	32.81			P	V
		841.8	29.7	-16.3	46	30.7	28.57	3.07	32.64			P	V
		934.9	31.5	-14.5	46	30.52	29.62	3.29	31.93			P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

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		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”.



<Ant. 2>

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 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)
802.11n HT20 CH 01 2412MHz		2389.74	55.63	-18.37	74	56.25	27.23	5.39	33.24	102	4	P	H
		2389.92	45.69	-8.31	54	46.29	27.23	5.39	33.22	102	4	A	H
	*	2410	105.13	-	-	105.65	27.28	5.42	33.22	102	4	P	H
	*	2410	97.64	-	-	98.16	27.28	5.42	33.22	102	4	A	H
													H
													H
		2389.92	64.69	-9.31	74	65.29	27.23	5.39	33.22	260	302	P	V
		2390	49.35	-4.65	54	49.95	27.23	5.39	33.22	260	302	A	V
	*	2410	109.66	-	-	110.18	27.28	5.42	33.22	260	302	P	V
	*	2410	102.17	-	-	102.69	27.28	5.42	33.22	260	302	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. 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)
802.11n HT20 CH 01 2412MHz		4824	36.25	-37.75	74	57.82	31.46	7.58	60.61	100	0	P	H
													H
													H
													H
		4824	35.99	-38.01	74	57.56	31.46	7.58	60.61	100	0	P	V
													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 802.11n HT20 (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.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT20 LF		78.6	27.17	-12.83	40	45.27	13.66	0.93	32.69			P	H
		94.26	28.94	-14.56	43.5	44.83	15.62	1.14	32.65			P	H
		188.76	30.96	-12.54	43.5	46.61	15.59	1.48	32.72	115	58	P	H
		300.7	22.98	-23.02	46	34.1	19.73	1.88	32.73			P	H
		835.5	30.38	-15.62	46	31.53	28.46	3.07	32.68			P	H
		948.2	31.24	-14.76	46	29.76	29.97	3.29	31.78			P	H
													H
													H
													H
													H
													H
													H
		37.29	31.77	-8.23	40	42.31	21.62	0.65	32.81	100	0	P	V
		78.6	29.62	-10.38	40	47.72	13.66	0.93	32.69			P	V
		94.26	28.24	-15.26	43.5	44.13	15.62	1.14	32.65			P	V
		627.6	27.05	-18.95	46	31.68	25.77	2.62	33.02			P	V
		846	29.95	-16.05	46	30.77	28.64	3.16	32.62			P	V
		951	31.67	-14.33	46	30.13	30	3.29	31.75			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.	
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”.



<MIMO Ant. 1+2>

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (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)
802.11n HT20 CH 11 2462MHz	*	2464	113.6	-	-	113.95	27.41	5.44	33.2	296	273	P	H
	*	2464	105.39	-	-	105.74	27.41	5.44	33.2	296	273	A	H
		2483.76	63.13	-10.87	74	63.39	27.46	5.46	33.18	296	273	P	H
		2483.52	51.09	-2.91	54	51.35	27.46	5.46	33.18	296	273	A	H
													H
													H
	*	2460	109.09	-	-	109.44	27.41	5.44	33.2	105	118	P	V
	*	2464	101.05	-	-	101.4	27.41	5.44	33.2	105	118	A	V
		2484.12	57.13	-16.87	74	57.39	27.46	5.46	33.18	105	118	P	V
		2483.52	48.01	-5.99	54	48.27	27.46	5.46	33.18	105	118	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+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)
802.11n HT20 CH 11 2462MHz		4926	36.56	-37.44	74	57.39	31.66	7.93	60.42	100	0	P	H
		7386	40.85	-33.15	74	56.14	36.37	9.53	61.19	100	0	P	H
													H
													H
		4926	38.61	-35.39	74	59.44	31.66	7.93	60.42	100	0	P	V
		7386	41.04	-32.96	74	56.33	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 802.11n HT20 (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 802.11n HT20 LF		78.6	27.59	-12.41	40	45.69	13.66	0.93	32.69	103	69	P	H
		94.26	30.22	-13.28	43.5	46.11	15.62	1.14	32.65			P	H
		188.76	30.83	-12.67	43.5	46.48	15.59	1.48	32.72			P	H
		687.1	28.01	-17.99	46	31.97	26.22	2.82	33			P	H
		850.2	30.37	-15.63	46	31.11	28.7	3.16	32.6			P	H
		954.5	31.81	-14.19	46	30.24	30	3.29	31.72			P	H
													H
													H
													H
													H
													H
													H
		36.75	32	-8	40	41.98	22.18	0.65	32.81	100	0	P	V
		78.6	30.23	-9.77	40	48.33	13.66	0.93	32.69			P	V
		94.26	29.06	-14.44	43.5	44.95	15.62	1.14	32.65			P	V
		638.1	26.75	-19.25	46	31.26	25.88	2.62	33.01			P	V
		749.4	29.31	-16.69	46	31.84	27.5	2.91	32.94			P	V
		913.9	32	-14	46	31.9	29.06	3.2	32.16			P	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”.