



Appendix B. Radiated Spurious Emission

Test Engineer :	Elvis Chen, Stan Hsieh, Karl Hou, Lewis He, and Nick Yu	Temperature :	23~25°C
		Relative Humidity :	45~47%

<For Sample 2>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	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)	
BLE CH 00 2402MHz		2386.68	52.86	-21.14	74	53.48	27.23	5.39	33.24	100	356	P	H	
		2376.6	43.32	-10.68	54	43.98	27.19	5.39	33.24	100	356	A	H	
	*	2401.753	101.17	-	-	101.77	27.23	5.39	33.22	100	356	P	H	
	*	2402.004	100.84	-	-	101.44	27.23	5.39	33.22	100	356	A	H	
													H	
														H
			2364.09	52.66	-21.34	74	53.38	27.14	5.39	33.25	306	54	P	V
			2389.02	43.27	-10.73	54	43.89	27.23	5.39	33.24	306	54	A	V
		*	2401.837	95.14	-	-	95.74	27.23	5.39	33.22	306	54	P	V
		*	2402.004	94.81	-	-	95.41	27.23	5.39	33.22	306	54	A	V
														V
														V
BLE CH 19 2440MHz		2332.95	51.34	-22.66	74	52.22	27.05	5.33	33.26	117	355	P	H	
		2359.95	41.8	-12.2	54	42.58	27.14	5.33	33.25	117	355	A	H	
		*	2440.247	101.06	-	-	101.48	27.37	5.42	33.21	117	355	P	H
		*	2439.997	100.39	-	-	100.81	27.37	5.42	33.21	117	355	A	H
			2487.2	51.83	-22.17	74	52.09	27.46	5.46	33.18	117	355	P	H
			2492.32	42.43	-11.57	54	42.64	27.5	5.46	33.17	117	355	A	H
			2327.64	51.55	-22.45	74	52.43	27.05	5.33	33.26	104	263	P	V
			2384.52	41.84	-12.16	54	42.5	27.19	5.39	33.24	104	263	A	V
		*	2440.247	94.54	-	-	94.96	27.37	5.42	33.21	104	263	P	V
		*	2439.997	93.89	-	-	94.31	27.37	5.42	33.21	104	263	A	V
			2490.12	52.14	-21.86	74	52.36	27.5	5.46	33.18	104	263	P	V
			2483.6	42.35	-11.65	54	42.61	27.46	5.46	33.18	104	263	A	V



BLE CH 39 2480MHz	*	2479.826	101.89	-	-	102.17	27.46	5.44	33.18	111	355	P	H
	*	2479.993	101.55	-	-	101.83	27.46	5.44	33.18	111	355	A	H
		2483.68	53.34	-20.66	74	53.6	27.46	5.46	33.18	111	355	P	H
		2483.52	46.87	-7.13	54	47.13	27.46	5.46	33.18	111	355	A	H
													H
													H
	*	2479.742	95.16	-	-	95.44	27.46	5.44	33.18	100	290	P	V
	*	2480.076	94.82	-	-	95.1	27.46	5.44	33.18	100	290	A	V
		2483.84	53.48	-20.52	74	53.74	27.46	5.46	33.18	100	290	P	V
		2483.52	44.14	-9.86	54	44.4	27.46	5.46	33.18	100	290	A	V
													V
													V
Remark	<ol style="list-style-type: none"> 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 												



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	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)	
BLE CH 00 2402MHz		4804	36.38	-37.62	74	58.02	31.42	7.58	60.64	100	0	P	H	
													H	
													H	
													H	
		4804	37.19	-36.81	74	58.83	31.42	7.58	60.64	100	0	P	V	
														V
														V
BLE CH 19 2440MHz		4882	38.11	-35.89	74	59.25	31.56	7.82	60.52	100	0	P	H	
		7323	43.26	-30.74	74	58.51	36.22	9.51	60.98	100	0	P	H	
													H	
													H	
		4882	39.08	-34.92	74	60.22	31.56	7.82	60.52	100	0	P	V	
		7323	43.93	-30.07	74	59.18	36.22	9.51	60.98	100	0	P	V	
														V
BLE CH 39 2480MHz		4960	38.44	-35.56	74	59.14	31.73	7.93	60.36	100	0	P	H	
		7440	42.01	-31.99	74	57.25	36.49	9.61	61.34	100	0	P	H	
													H	
													H	
		4960	38.31	-35.69	74	59.01	31.73	7.93	60.36	100	0	P	V	
		7440	42.22	-31.78	74	57.46	36.49	9.61	61.34	100	0	P	V	
														V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.													



Emission below 1GHz

2.4GHz BLE (LF)

BLE	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)	
2.4GHz BLE LF		31.08	23.59	-16.41	40	36.3	19.46	0.65	32.82	144	55	P	H	
		85.08	22.14	-17.86	40	45.07	8.6	1.14	32.67			P	H	
		191.46	23.21	-20.29	43.5	44.98	9.47	1.48	32.72			P	H	
		329.4	21.53	-24.47	46	37.72	14.63	1.94	32.76			P	H	
		757.8	24.09	-21.91	46	32.43	21.68	2.91	32.93			P	H	
		932.1	27.53	-18.47	46	32.29	23.91	3.29	31.96			P	H	
														H
														H
														H
														H
														H
														H
			30.27	31.57	-8.43	40	43.74	20	0.65	32.82	100	58	P	V
			33.51	29.71	-10.29	40	44.03	17.84	0.65	32.81			P	V
			47.82	29.72	-10.28	40	51.12	10.45	0.93	32.78			P	V
			513.5	20.77	-25.23	46	33.04	18.33	2.33	32.93			P	V
			897.8	26.87	-19.13	46	32.82	23.17	3.2	32.32			P	V
			907.6	27.76	-18.24	46	33.41	23.37	3.2	32.22			P	V
														V
														V
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



<For Sample 1>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
		(MHz)	(dBμV/m)	(dB)	Limit	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
					Line	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 39 2480MHz	*	2479.826	93.98	-	-	94.26	27.46	5.44	33.18	115	329	P	H	
	*	2479.993	93.64	-	-	93.92	27.46	5.44	33.18	115	329	A	H	
		2494.64	53.44	-20.56	74	53.65	27.5	5.46	33.17	115	329	P	H	
		2483.52	43.77	-10.23	54	44.03	27.46	5.46	33.18	115	329	A	H	
													H	
														H
	*	2479.826	100.93	-	-	101.21	27.46	5.44	33.18	165	323	P	V	
	*	2480.076	100.6	-	-	100.88	27.46	5.44	33.18	165	323	A	V	
		2483.52	53.96	-20.04	74	54.22	27.46	5.46	33.18	165	323	P	V	
		2483.52	46.04	-7.96	54	46.3	27.46	5.46	33.18	165	323	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

BLE (Harmonic @ 3m)

BLE	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)
BLE CH 39 2480MHz		4962	37.66	-36.34	74	58.24	31.73	8.05	60.36	100	0	P	H
		7440	42.41	-31.59	74	57.65	36.49	9.61	61.34	100	0	P	H
													H
													H
		4962	37.67	-36.33	74	58.25	31.73	8.05	60.36	100	0	P	V
		7440	42.39	-31.61	74	57.63	36.49	9.61	61.34	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 BLE (LF)

BLE	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)	
2.4GHz BLE LF		79.95	26.77	-13.23	40	50.65	7.88	0.93	32.69			P	H	
		89.4	29.96	-13.54	43.5	52.4	9.08	1.14	32.66			P	H	
		105.87	35.56	-7.94	43.5	56.06	11	1.14	32.64	100	223	P	H	
		307.7	17.36	-28.64	46	34.2	14.02	1.88	32.74			P	H	
		745.9	29.2	-16.8	46	37.71	21.52	2.91	32.94			P	H	
		948.9	26.9	-19.1	46	31.1	24.28	3.29	31.77			P	H	
														H
														H
														H
														H
														H
														H
														H
			30	33.61	-6.39	40	45.78	20	0.65	32.82	163	99	P	V
			32.7	29.78	-10.22	40	43.56	18.38	0.65	32.81			P	V
			106.68	31.6	-11.9	43.5	52	11.1	1.14	32.64			P	V
			477.1	22.25	-23.75	46	35.07	17.78	2.3	32.9			P	V
			746.6	24.57	-21.43	46	33.06	21.54	2.91	32.94			P	V
			948.2	26.09	-19.91	46	30.3	24.28	3.29	31.78			P	V
														V
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



<For Sample 3>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
		(MHz)	(dBμV/m)	(dB)	Limit	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
					Line	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 39 2480MHz	*	2479.742	94.87	-	-	95.15	27.46	5.44	33.18	134	262	P	H	
	*	2480.076	94.2	-	-	94.48	27.46	5.44	33.18	134	262	A	H	
		2493.2	51.82	-22.18	74	52.03	27.5	5.46	33.17	134	262	P	H	
		2484.08	42.19	-11.81	54	42.45	27.46	5.46	33.18	134	262	A	H	
													H	
														H
	*	2480.243	98.42	-	-	98.7	27.46	5.44	33.18	102	10	P	V	
	*	2480.076	97.76	-	-	98.04	27.46	5.44	33.18	102	10	A	V	
		2486.04	51.07	-22.93	74	51.33	27.46	5.46	33.18	102	10	P	V	
		2494.36	42.04	-11.96	54	42.25	27.5	5.46	33.17	102	10	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

BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dB μ V/m)	Over Limit (dB)	Limit Line (dB μ V/m)	Read Level (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 39 2480MHz		4962	37.53	-36.47	74	58.11	31.73	8.05	60.36	100	0	P	H
		7440	41.27	-32.73	74	56.51	36.49	9.61	61.34	100	0	P	H
													H
													H
		4962	37.75	-36.25	74	58.33	31.73	8.05	60.36	100	0	P	V
		7440	41.27	-32.73	74	56.51	36.49	9.61	61.34	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 BLE (LF)

BLE	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)	
2.4GHz BLE LF		31.89	22.91	-17.09	40	36.16	18.92	0.65	32.82			P	H	
		85.89	26.24	-13.76	40	49.05	8.72	1.14	32.67			P	H	
		123.42	30.36	-13.14	43.5	49.94	11.93	1.14	32.65	133	56	P	H	
		405.7	21.08	-24.92	46	35.18	16.59	2.16	32.85			P	H	
		752.2	23.19	-22.81	46	31.58	21.63	2.91	32.93			P	H	
		976.2	25.71	-28.29	54	29.6	24.2	3.38	31.47			P	H	
														H
														H
														H
														H
														H
														H
														H
			31.62	35.04	-4.96	40	48.29	18.92	0.65	32.82	105	247	P	V
			62.67	26.86	-13.14	40	52.39	6.28	0.93	32.74			P	V
			111.54	24.77	-18.73	43.5	44.78	11.49	1.14	32.64			P	V
			414.8	25.55	-20.45	46	39.49	16.75	2.16	32.85			P	V
			470.1	23.85	-22.15	46	36.79	17.66	2.3	32.9			P	V
			918.8	24.95	-21.05	46	30.24	23.61	3.2	32.1			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	Peak or Average
H/V	Horizontal or Vertical



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

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)
802.11b 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

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

For Peak Limit @ 2390MHz:

- 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- 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)
- 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”.