# Appendix B. Radiated Spurious Emission

Test Engineer :	Toung Loo	Temperature :	23~24°C
rest Engineer:	Tsung Lee	Relative Humidity :	47~49%

### 2.4GHz 2400~2483.5MHz

## BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )	( dB )	( dBµV/m )	(dB <sub>µ</sub> V)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
		2375.94	50.53	-23.47	74	51.19	27.19	5.39	33.24	117	89	Р	Н
		2387.595	39.93	-14.07	54	40.55	27.23	5.39	33.24	117	89	Α	Н
	*	2402	94.61	-	-	95.21	27.23	5.39	33.22	117	89	Р	Н
	*	2402	94.42	-	-	95.02	27.23	5.39	33.22	117	89	Α	Н
BLE													Н
CH 00													Н
2402MHz		2361.135	51.44	-22.56	74	52.22	27.14	5.33	33.25	378	38	Р	V
2402WII 12		2387.49	39.9	-14.1	54	40.52	27.23	5.39	33.24	378	38	Α	V
	*	2402	89.16	1	-	89.76	27.23	5.39	33.22	378	38	Р	V
	*	2402	89.05	1	-	89.65	27.23	5.39	33.22	378	38	Α	V
													V
													V
		2376.5	51.91	-22.09	74	52.57	27.19	5.39	33.24	139	88	Р	Н
		2384.9	39.89	-14.11	54	40.55	27.19	5.39	33.24	139	88	Α	Н
	*	2440	94.79	-	-	95.21	27.37	5.42	33.21	139	88	Р	Н
	*	2440	94.4	-	-	94.82	27.37	5.42	33.21	139	88	Α	Н
DI E		2493.77	50.96	-23.04	74	51.17	27.5	5.46	33.17	139	88	Р	Н
BLE CH 19		2483.83	40.29	-13.71	54	40.55	27.46	5.46	33.18	139	88	Α	Н
2440MHz		2333.38	50.76	-23.24	74	51.64	27.05	5.33	33.26	373	35	Р	٧
277VIVII 12		2389.38	39.89	-14.11	54	40.51	27.23	5.39	33.24	373	35	Α	٧
	*	2440	89.73	-	-	90.15	27.37	5.42	33.21	373	35	Р	٧
	*	2440	89.64	1	-	90.06	27.37	5.42	33.21	373	35	Α	٧
		2483.76	50.78	-23.22	74	51.04	27.46	5.46	33.18	373	35	Р	V
		2485.72	40.34	-13.66	54	40.6	27.46	5.46	33.18	373	35	Α	V

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## SPORTON LAB. FCC RF Test Report

		94.78	-	-	95.06	27.46	5.44	33.18	100	94	Р	Н
*	2480	94.64	-	-	94.92	27.46	5.44	33.18	100	94	Α	Н
	2487.56	51	-23	74	51.22	27.5	5.46	33.18	100	94	Р	Н
	2483.52	40.73	-13.27	54	40.99	27.46	5.46	33.18	100	94	Α	Н
												Н
												Н
*	2480	88.5	-	-	88.78	27.46	5.44	33.18	363	182	Р	V
*	2480	87.95	-	-	88.23	27.46	5.44	33.18	363	182	Α	V
	2487.88	51.66	-22.34	74	51.88	27.5	5.46	33.18	363	182	Р	V
	2483.56	40.39	-13.61	54	40.65	27.46	5.46	33.18	363	182	Α	V
												V
												V
	·		Deals as d	A.,	ais lina							
	* * *	2487.56 2483.52  * 2480  * 2480  2487.88 2483.56	2487.56 51 2483.52 40.73  * 2480 88.5  * 2480 87.95 2487.88 51.66 2483.56 40.39  1. No other spurious found.	2487.56 51 -23 2483.52 40.73 -13.27  * 2480 88.5 -  * 2480 87.95 -  2487.88 51.66 -22.34 2483.56 40.39 -13.61	2487.56 51 -23 74  2483.52 40.73 -13.27 54  * 2480 88.5  * 2480 87.95  2487.88 51.66 -22.34 74  2483.56 40.39 -13.61 54	2487.56 51 -23 74 51.22 2483.52 40.73 -13.27 54 40.99 * 2480 88.5 88.78 * 2480 87.95 88.23 2487.88 51.66 -22.34 74 51.88 2483.56 40.39 -13.61 54 40.65	2480       94.04       -       -       94.92       27.46         2487.56       51       -23       74       51.22       27.5         2483.52       40.73       -13.27       54       40.99       27.46         *       2480       88.5       -       -       88.78       27.46         *       2480       87.95       -       -       88.23       27.46         2487.88       51.66       -22.34       74       51.88       27.5         2483.56       40.39       -13.61       54       40.65       27.46         1. No other spurious found.	2480       94.64       -       -       94.92       27.46       5.44         2487.56       51       -23       74       51.22       27.5       5.46         2483.52       40.73       -13.27       54       40.99       27.46       5.46         *       2480       88.5       -       -       88.78       27.46       5.44         *       2487.88       51.66       -22.34       74       51.88       27.5       5.46         2483.56       40.39       -13.61       54       40.65       27.46       5.46         1.       No other spurious found.	2480       94.04       -       -       94.92       27.46       5.44       33.18         2487.56       51       -23       74       51.22       27.5       5.46       33.18         2483.52       40.73       -13.27       54       40.99       27.46       5.46       33.18         *       2480       88.5       -       -       88.78       27.46       5.44       33.18         2487.88       51.66       -22.34       74       51.88       27.5       5.46       33.18         2483.56       40.39       -13.61       54       40.65       27.46       5.46       33.18         1. No other spurious found.	2480       34.04       -       -       34.92       27.46       3.44       33.18       100         2487.56       51       -23       74       51.22       27.5       5.46       33.18       100         2483.52       40.73       -13.27       54       40.99       27.46       5.46       33.18       100         *       2480       88.5       -       -       88.78       27.46       5.44       33.18       363         2487.88       51.66       -22.34       74       51.88       27.5       5.46       33.18       363         2483.56       40.39       -13.61       54       40.65       27.46       5.46       33.18       363         1. No other spurious found.	2487.56       51       -23       74       51.22       27.5       5.46       33.18       100       94         2483.52       40.73       -13.27       54       40.99       27.46       5.46       33.18       100       94         *       2480       88.5       -       -       88.78       27.46       5.44       33.18       363       182         *       2480       87.95       -       -       88.23       27.46       5.44       33.18       363       182         2487.88       51.66       -22.34       74       51.88       27.5       5.46       33.18       363       182         2483.56       40.39       -13.61       54       40.65       27.46       5.46       33.18       363       182         1. No other spurious found.	2487.56       51       -23       74       51.22       27.5       5.46       33.18       100       94       P         2483.52       40.73       -13.27       54       40.99       27.46       5.46       33.18       100       94       A         *       2480       88.5       -       -       88.78       27.46       5.44       33.18       363       182       P         *       2480       87.95       -       -       88.23       27.46       5.44       33.18       363       182       A         2487.88       51.66       -22.34       74       51.88       27.5       5.46       33.18       363       182       P         2483.56       40.39       -13.61       54       40.65       27.46       5.46       33.18       363       182       A     1. No other spurious found.

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### 2.4GHz 2400~2483.5MHz

Report No. : FR642912-02

### BLE (Harmonic @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
		. ,		Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )	(dB)	( dBµV/m )	(dBµV)	( dB/m )	(dB)	( dB )	( cm )	( deg )	(P/A)	(H/V)
		4804	45.03	-28.97	74	38.62	31.42	7.58	32.59	100	0	Р	Н
													Н
BLE													Н
CH 00													Н
2402MHz		4804	44.39	-29.61	74	37.98	31.42	7.58	32.59	100	0	Р	V
2402111112													٧
													<b>V</b>
													<b>V</b>
		4880	44.65	-29.35	74	37.97	31.56	7.7	32.58	100	0	Р	Н
		7320	50.4	-23.6	74	38.19	36.22	9.49	33.5	100	0	Р	Н
													Н
BLE													Н
CH 19 2440MHz		4880	45.49	-28.51	74	38.81	31.56	7.7	32.58	100	0	Р	٧
2440WITI2		7320	50.35	-23.65	74	38.14	36.22	9.49	33.5	100	0	Р	٧
													٧
													٧
		4960	45.76	-28.24	74	38.68	31.73	7.93	32.58	100	0	Р	Н
		7440	50.41	-23.59	74	37.87	36.49	9.61	33.56	100	0	Р	Н
													Н
BLE													Н
CH 39		4960	44.85	-29.15	74	37.77	31.73	7.93	32.58	100	0	Р	٧
2480MHz		7440	50.24	-23.76	74	37.7	36.49	9.61	33.56	100	0	Р	٧
													٧
													٧
	1 NI-	o other spurious	r found	ı	I	ı	<u> </u>		1	ı	1	1	
Remark		results are PA		Peak and	l Δverage lim	it line							
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## Emission below 1GHz 2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBµV/m )	Limit (dB)	Line ( dBµV/m )	Level (dBµV)	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg.	(H/V
		30	23.01	-16.99	40	29.08	26.1	0.65	32.82	( 0 )	( 3.09 )	P	Н
		123.42	17.31	-26.19	43.5	30.96	17.86	1.14	32.65			Р	Н
		192	19.13	-24.37	43.5	34.69	15.68	1.48	32.72			Р	Н
		637.4	26.68	-19.32	46	31.21	25.87	2.62	33.02			Р	Н
		765.5	29.02	-16.98	46	31.35	27.62	2.97	32.92			Р	Н
		948.2	31.66	-14.34	46	30.18	29.97	3.29	31.78	100	57	Р	Н
													Н
													Н
													Н
													Н
2.4GHz													Н
BLE													Н
LF		54.3	26.69	-13.31	40	44.61	13.92	0.93	32.77	100	87	Р	V
		72.12	21.62	-18.38	40	40.56	12.84	0.93	32.71			Р	V
		131.52	20.75	-22.75	43.5	34.08	18	1.33	32.66			Р	V
		633.9	26.33	-19.67	46	30.89	25.84	2.62	33.02			Р	V
		752.9	28.88	-17.12	46	31.38	27.52	2.91	32.93			Р	V
		948.9	31.16	-14.84	46	29.67	29.97	3.29	31.77			Р	V
													V
													V
													V
													V
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## 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 <b>over limit</b> line.
P/A	Peak or Average
H/V	Horizontal or Vertical

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### 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	Р	Н
CH 01												-	
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	Α	Н

1. Level( $dB\mu V/m$ ) =

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

2. Over Limit(dB) = Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

#### For Peak Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 54.51(dB\mu V) 35.86 (dB)$
- $= 55.45 (dB\mu V/m)$
- 2. Over Limit(dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 55.45(dB\mu V/m) 74(dB\mu V/m)$
- = -18.55(dB)

#### For Average Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 42.6(dB\mu V) 35.86 (dB)$
- $= 43.54 (dB\mu V/m)$
- 2. Over Limit(dB)
- = Level( $dB\mu V/m$ ) Limit Line( $dB\mu V/m$ )
- $= 43.54(dB\mu V/m) 54(dB\mu V/m)$
- = -10.46(dB)

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

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