# Appendix A. Radiated Spurious Emission

Test Engineer :	Karl Hou and Jie Cheng	Temperature :	24~25°C
		Relative Humidity :	50~51%

### 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 )	( dBµV )	( dB/m )	( dB )	(dB)	( cm )	( deg )	(P/A)	(H/V)
		2389.47	51.53	-22.47	74	47.79	32.77	4.62	33.65	114	200	Р	Н
		2370.03	39.84	-14.16	54	36.17	32.73	4.6	33.66	114	200	Α	Н
	*	2402	96.68	-	-	92.94	32.77	4.62	33.65	114	200	Р	Н
	*	2402	95.48	-	-	91.74	32.77	4.62	33.65	114	200	Α	Н
													Н
BLE													Н
CH 00 2402MHz		2389.47	52.12	-21.88	74	48.38	32.77	4.62	33.65	135	246	Р	V
2402WITI2		2388.03	38.65	-15.35	54	34.91	32.77	4.62	33.65	135	246	Α	V
	*	2402	89.93	-	-	86.19	32.77	4.62	33.65	135	246	Р	V
	*	2402	88.5	-	-	84.76	32.77	4.62	33.65	135	246	Α	V
													V
													٧
Remark		o other spurious							•			•	

2. All results are PASS against Peak and Average limit line.

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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)
		2317.83	51.38	-22.62	74	47.91	32.62	4.55	33.7	141	4	Р	Н
		2381.55	38.59	-15.41	54	34.9	32.73	4.62	33.66	141	4	Α	Н
	*	2440	96.9	ı	-	92.93	32.89	4.68	33.6	141	4	Р	Н
	*	2440	95.65	-	-	91.68	32.89	4.68	33.6	141	4	Α	Н
D. F		2499.44	51.66	-22.34	74	47.49	33	4.73	33.56	141	4	Р	Н
BLE CH 19		2485.48	39.02	-14.98	54	34.9	32.96	4.73	33.57	141	4	Α	Н
2440MHz		2385.6	51.4	-22.6	74	47.66	32.77	4.62	33.65	131	250	Р	V
2440WII 12		2387.22	38.6	-15.4	54	34.86	32.77	4.62	33.65	131	250	Α	V
	*	2440	88.63	ı	-	84.66	32.89	4.68	33.6	131	250	Р	V
	*	2440	87.26	-	-	83.29	32.89	4.68	33.6	131	250	Α	٧
		2485.6	51.69	-22.31	74	47.57	32.96	4.73	33.57	131	250	Р	٧
		2492.52	38.99	-15.01	54	34.82	33	4.73	33.56	131	250	Α	V
	*	2480	96.45	-	-	92.33	32.96	4.73	33.57	109	170	Р	Н
	*	2480	95.13	-	-	91.01	32.96	4.73	33.57	109	170	Α	Н
		2483.52	56.05	-17.95	74	51.93	32.96	4.73	33.57	109	170	Р	Н
		2483.52	47.19	-6.81	54	43.07	32.96	4.73	33.57	109	170	Α	Н
DI E													Н
BLE CH 39													Н
2480MHz	*	2480	89.68	-	-	85.56	32.96	4.73	33.57	199	293	Р	V
	*	2480	88.12	-	-	84	32.96	4.73	33.57	199	293	Α	V
		2484.08	51.99	-22.01	74	47.87	32.96	4.73	33.57	199	293	Р	V
		2483.52	42.05	-11.95	54	37.93	32.96	4.73	33.57	199	293	Α	V
													V
													V
Remark		o other spurious I results are PA		eak and	l Average lim	it line.							

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### 2.4GHz 2400~2483.5MHz

## 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	40	-34	74	57.08	35.04	6.52	58.64	100	0	Р	Н
													Н
DI E													Н
BLE CH 00													Н
2402MHz		4804	40.39	-33.61	74	57.47	35.04	6.52	58.64	100	0	Р	V
													V
													V
													V
		4880	46.31	-27.69	74	63.23	35.02	6.58	58.52	100	0	Р	Н
		7320	42.61	-31.39	74	56.16	36.4	8.24	58.19	100	0	Р	Н
BLE													Н
CH 19													Н
2440MHz		4880	45.33	-28.67	74	62.25	35.02	6.58	58.52	100	0	Р	V
		7320	42.44	-31.56	74	55.99	36.4	8.24	58.19	100	0	Р	V
													V
													V
		4960	50.47	-23.53	74	67.21	35.01	6.61	58.36	100	0	Р	Н
		7440	42.1	-31.9	74	55.68	36.47	8.36	58.41	100	0	Р	Н
BLE													Н
CH 39													Н
2480MHz		4960	46.06	-27.94	74	62.8	35.01	6.61	58.36	100	0	Р	V
		7440	41.84	-32.16	74	55.42	36.47	8.36	58.41	100	0	Р	V
													V
													V
Remark		o other spurious		eak and	Average 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.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )		( dBµV/m )	(dBµV)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V
		121.8	11.72	-31.78	43.5	30.77	11.54	1.19	31.78	-	-	Р	Н
		149.07	27.38	-16.12	43.5	46.95	10.94	1.27	31.78	189	100	Р	Н
		212.25	9.51	-33.99	43.5	30.55	9.22	1.52	31.78	-	-	Р	Н
		635.3	18.96	-27.04	46	28.01	20.45	2.54	32.04	ı	-	Р	Н
		734.7	20.48	-25.52	46	27.74	22.02	2.72	32	1	-	Р	Н
		855.8	23.05	-22.95	46	28.62	23.15	2.93	31.65	1	-	Р	Н
													Н
													Н
													Н
													Н
													Н
2.4GHz													Н
BLE LF		56.73	32.49	-7.51	40	57.24	6.2	0.85	31.8	105	25	Р	V
LF		96.15	17.53	-25.97	43.5	38.79	9.44	1.08	31.78	-	-	Р	V
		152.85	23.88	-19.62	43.5	43.58	10.8	1.28	31.78	-	-	Р	V
		498.1	16.46	-29.54	46	28.14	17.98	2.23	31.89	-	-	Р	V
		638.8	19.79	-26.21	46	28.87	20.41	2.55	32.04	-	-	Р	V
		760.6	21.32	-24.68	46	28.33	22.2	2.76	31.97	-	-	Р	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 per 15.209(c).
!	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:

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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 )	(dB <sub>µ</sub> V)	( 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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