



Appendix A. Radiated Spurious Emission

Test Engineer :	Derreck Chen	Temperature :	22~23°C
		Relative Humidity :	45~47%

2.4GHz 2400~2483.5MHz

BLE (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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 00 2402MHz		2353.83	50.98	-23.02	74	51.94	27.14	5.95	34.05	338	120	P	H	
		2370.84	41.8	-12.2	54	42.64	27.19	6.01	34.04	338	120	A	H	
	*	2402.254	101.98	-	-	102.78	27.23	6.01	34.04	338	120	P	H	
	*	2402.087	101.39	-	-	102.19	27.23	6.01	34.04	338	120	A	H	
													H	
														H
			2353.29	50.87	-23.13	74	51.83	27.14	5.95	34.05	100	228	P	V
			2340.06	42.19	-11.81	54	43.19	27.1	5.95	34.05	100	228	A	V
	*		2402	99.34	-	-	100.14	27.23	6.01	34.04	100	228	P	V
	*		2402	98.77	-	-	99.57	27.23	6.01	34.04	100	228	A	V
														V
BLE CH 19 2440MHz		2357.07	51.19	-22.81	74	52.15	27.14	5.95	34.05	331	115	P	H	
		2387.13	41.56	-12.44	54	42.36	27.23	6.01	34.04	331	115	A	H	
	*	2440	102.37	-	-	102.99	27.37	6.04	34.03	331	115	P	H	
	*	2440	101.85	-	-	102.47	27.37	6.04	34.03	331	115	A	H	
			2498.28	52.02	-21.98	74	52.43	27.5	6.09	34	331	115	P	H
			2496.4	42.05	-11.95	54	42.46	27.5	6.09	34	331	115	A	H
			2375.16	51.24	-22.76	74	52.08	27.19	6.01	34.04	100	225	P	V
			2340.06	41.74	-12.26	54	42.74	27.1	5.95	34.05	100	225	A	V
	*		2440	100.64	-	-	101.26	27.37	6.04	34.03	100	225	P	V
	*		2440	100.06	-	-	100.68	27.37	6.04	34.03	100	225	A	V
			2499.04	51.06	-22.94	74	51.47	27.5	6.09	34	100	225	P	V
			2498.52	42.31	-11.69	54	42.72	27.5	6.09	34	100	225	A	V



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)
BLE CH 39 2480MHz	*	2480	102.33	-	-	102.81	27.46	6.07	34.01	356	124	P	H
	*	2480	101.77	-	-	102.25	27.46	6.07	34.01	356	124	A	H
		2483.56	51.21	-22.79	74	51.67	27.46	6.09	34.01	356	124	P	H
		2483.8	42.37	-11.63	54	42.83	27.46	6.09	34.01	356	124	A	H
													H
													H
	*	2480	102.73	-	-	103.21	27.46	6.07	34.01	122	240	P	V
	*	2480	102.18	-	-	102.66	27.46	6.07	34.01	122	240	A	V
		2485.04	51.22	-22.78	74	51.68	27.46	6.09	34.01	122	240	P	V
		2485.4	42.48	-11.52	54	42.94	27.46	6.09	34.01	122	240	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	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)	
BLE CH 00 2402MHz		4804	34.68	-39.32	74	28.28	31.3	8.65	33.55	150	0	P	H	
													H	
													H	
													H	
			4804	35.52	-38.48	74	29.12	31.3	8.65	33.55	150	0	P	V
														V
														V
BLE CH 19 2440MHz		4880	34.94	-39.06	74	28.38	31.41	8.69	33.54	150	0	P	H	
		7320	40	-34	74	27.75	36.32	10.39	34.46	150	0	P	H	
													H	
													H	
			4880	35.59	-38.41	74	29.03	31.41	8.69	33.54	150	0	P	V
			7320	40.67	-33.33	74	28.42	36.32	10.39	34.46	150	0	P	V
														V
BLE CH 39 2480MHz		4960	34.57	-39.43	74	27.78	31.54	8.79	33.54	150	0	P	H	
		7440	40.18	-33.82	74	27.59	36.59	10.52	34.52	150	0	P	H	
													H	
													H	
			4960	35.86	-38.14	74	29.07	31.54	8.79	33.54	150	0	P	V
			7440	40.8	-33.2	74	28.21	36.59	10.52	34.52	150	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 @ 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+2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
2.4GHz BLE LF		66.45	18.75	-21.25	40	44.58	4.92	1.04	31.79			P	H	
		113.97	26.76	-16.74	43.5	45.96	11.3	1.28	31.78			P	H	
		250.05	23.19	-22.81	46	41.01	12.01	1.94	31.77			P	H	
		468	29.52	-16.48	46	41.97	16.84	2.57	31.86	154	112	P	H	
		624.8	25.98	-20.02	46	36.06	19	2.96	32.04			P	H	
		780.2	26.61	-19.39	46	35.5	19.7	3.35	31.94			P	H	
														H
														H
														H
														H
														H
														H
			48.36	24.12	-15.88	40	46.61	8.27	1.04	31.8			P	V
			172.02	29.8	-13.7	43.5	51.26	8.68	1.64	31.78	182	214	P	V
			250.05	17.94	-28.06	46	35.76	12.01	1.94	31.77			P	V
			447.7	22.24	-23.76	46	35.06	16.45	2.57	31.84			P	V
			624.8	23.56	-22.44	46	33.64	19	2.96	32.04			P	V
			780.2	28.04	-17.96	46	36.93	19.7	3.35	31.94			P	V
														V
														V
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



Note symbol for Part 15C rule

15C 2.4GHz 2400~2483.5MHz

*	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 over limit line.
@	Frequency falls in non-restricted band is passed and tested by conducted band edges and spurious emission measurement in the test report.
#	Peak measured value is under 20dB and complies with the average limit, so it is unnecessary to perform an average measurement per clause 6.5.4.2 of ANSI C63.10.
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) =

$$\text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dBμV)} - \text{Preamp Factor(dB)}$$

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dBμV)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 54.51(\text{dBμV}) - 35.86(\text{dB})$$

$$= 55.45(\text{dBμV/m})$$

2. Over Limit(dB)

$$= \text{Level(dBμV/m)} - \text{Limit Line(dBμV/m)}$$

$$= 55.45(\text{dBμV/m}) - 74(\text{dBμV/m})$$

$$= -18.55(\text{dB})$$

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

$$= \text{Antenna Factor(dB/m)} + \text{Cable Loss(dB)} + \text{Read Level(dBμV)} - \text{Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 42.6(\text{dBμV}) - 35.86(\text{dB})$$

$$= 43.54(\text{dBμV/m})$$

2. Over Limit(dB)

$$= \text{Level(dBμV/m)} - \text{Limit Line(dBμV/m)}$$

$$= 43.54(\text{dBμV/m}) - 54(\text{dBμV/m})$$

$$= -10.46(\text{dB})$$

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