



Appendix C. Radiated Spurious Emission

Test Engineer :	Carry Xu	Temperature :	22~23°C
		Relative Humidity :	41~42%

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2312.21	53.98	-20.02	74	48.54	31.9	7.01	33.47	127	54	P	H
	*	2312.21	29.19	-24.81	54	-	-	-	-	-	-	A	H
		2402	103.68	-	-	97.76	32.2	7.16	33.44	127	54	P	H
		2402	78.89	-	-	-	-	-	-	-	-	A	H
		2363.17	55.41	-18.59	74	48.68	33.08	7.1	33.45	102	133	P	V
	*	2363.17	30.62	-23.38	54	-	-	-	-	-	-	A	V
		2402	105.88	-	-	98.66	33.5	7.16	33.44	102	133	P	V
		2402	81.09	-	-	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	101.44	-	-	95.8	31.8	7.27	33.43	154	111	P	H
		2480	76.65	-	-	-	-	-	-	-	-	A	H
		2483.62	56.20	-17.80	74	50.56	31.8	7.27	33.43	154	111	P	H
		2483.62	31.41	-22.59	54	-	-	-	-	-	-	A	H
	*	2480	104.59	-	-	97.89	32.86	7.27	33.43	100	268	P	V
		2480	79.80	-	-	-	-	-	-	-	-	A	V
		2483.68	57.09	-16.91	74	50.39	32.86	7.27	33.43	100	268	P	V
		2483.68	32.30	-21.70	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4806	39.49	-34.51	74	54.33	34.96	10.24	60.04	100	360	P	H
		4806	39.7	-34.3	74	54.66	34.84	10.24	60.04	100	360	P	V
BT CH 39 2441MHz		4884	41.19	-32.81	74	55.86	35.04	10.32	60.03	100	360	P	H
		7320	43.01	-30.99	74	53.9	36.86	12.77	60.52	100	360	P	H
		4884	41	-33	74	55.88	34.83	10.32	60.03	100	360	P	V
		7320	43.2	-30.8	74	54.55	36.4	12.77	60.52	100	360	P	V
BT CH 78 2480MHz		4962	40.97	-33.03	74	55.41	35.14	10.43	60.01	100	360	P	H
		7440	43.06	-30.94	74	53.83	36.89	12.88	60.54	100	360	P	H
		4962	41.14	-32.86	74	55.91	34.81	10.43	60.01	100	360	P	V
		7440	42.28	-31.72	74	53.47	36.47	12.88	60.54	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	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)
2.4GHz BT LF		30.97	20.55	-19.45	40	27.62	24.57	0.56	32.2	-	-	P	H
		155.13	27.86	-15.64	43.5	41.15	16.8	2.01	32.1	125	256	P	H
		215.27	26.1	-17.4	43.5	40.58	15.25	2.4	32.13	-	-	P	H
		304.51	22.84	-23.16	46	32.65	19.45	2.85	32.11	-	-	P	H
		651.77	26.82	-19.18	46	28.35	26.51	4.16	32.2	-	-	P	H
		782.72	28.7	-17.3	46	28.23	28.2	4.57	32.3	-	-	P	H
		33.88	30.08	-9.92	40	38.7	22.98	0.6	32.2	-	-	P	V
		47.46	30.34	-9.66	40	45.86	15.87	0.81	32.2	216	242	P	V
		151.25	25.42	-18.08	43.5	38.49	17.04	1.99	32.1	-	-	P	V
		210.42	27.23	-16.27	43.5	41.78	15.2	2.37	32.12	-	-	P	V
		579.99	25.61	-20.39	46	28.35	25.64	3.92	32.3	-	-	P	V
		781.75	28.2	-17.8	46	27.73	28.2	4.57	32.3	-	-	P	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:

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	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)
BT CH 00 2402MHz		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

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)

2. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path 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) + Path 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)

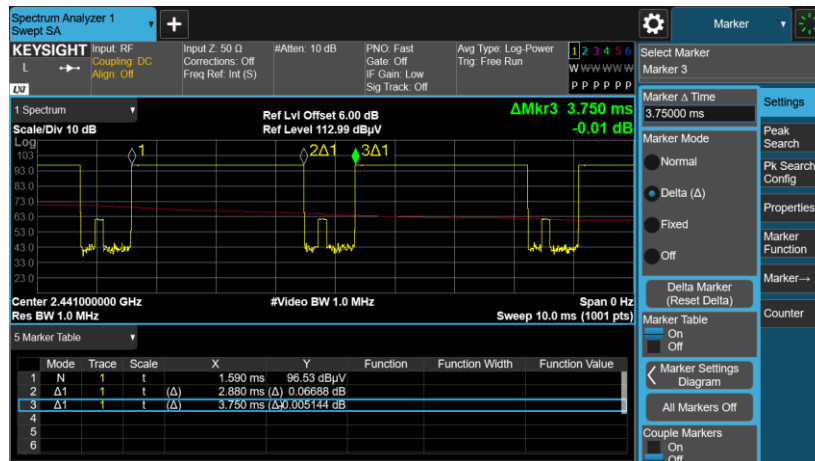
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

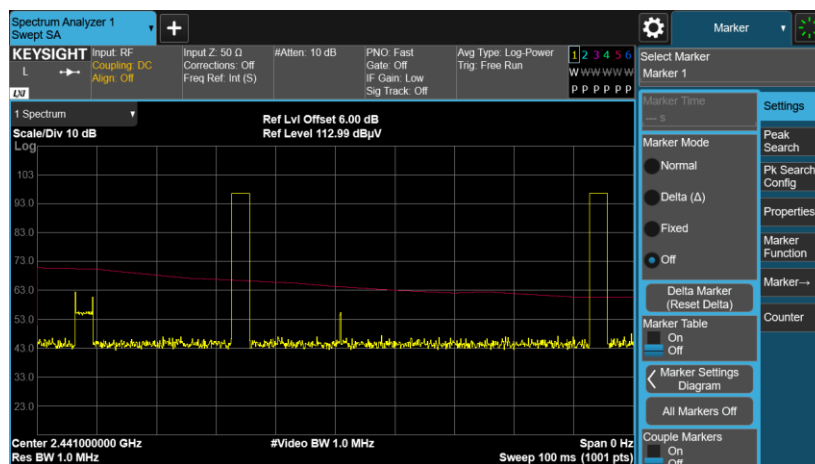
Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Duty Cycle Plots

DH5 on time (One Pulse) Plot on Channel 39



DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.