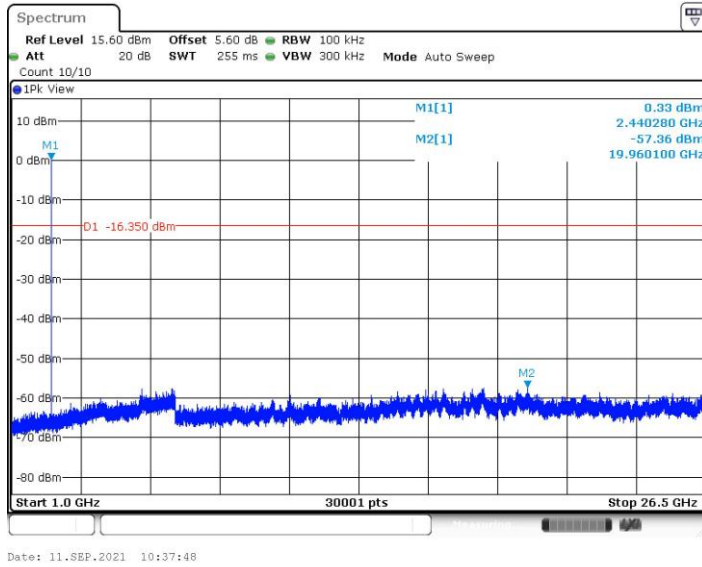
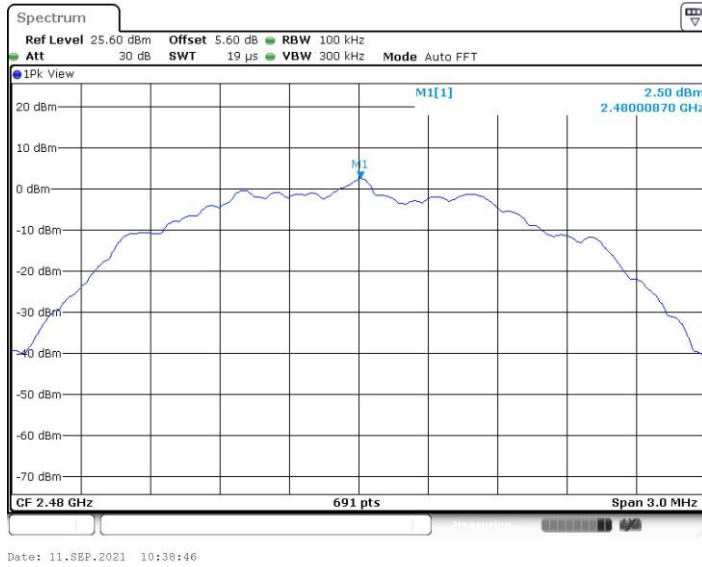




BLE_2M_Ant2_2440_1000~26500

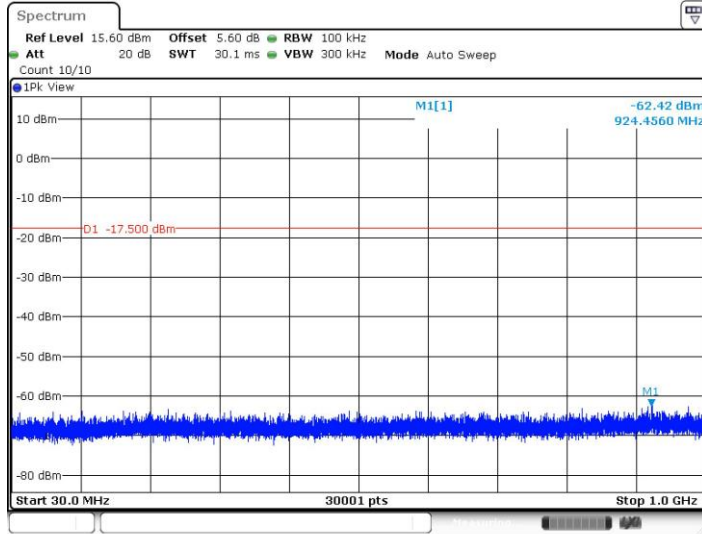


BLE_2M_Ant2_2480_0~Reference

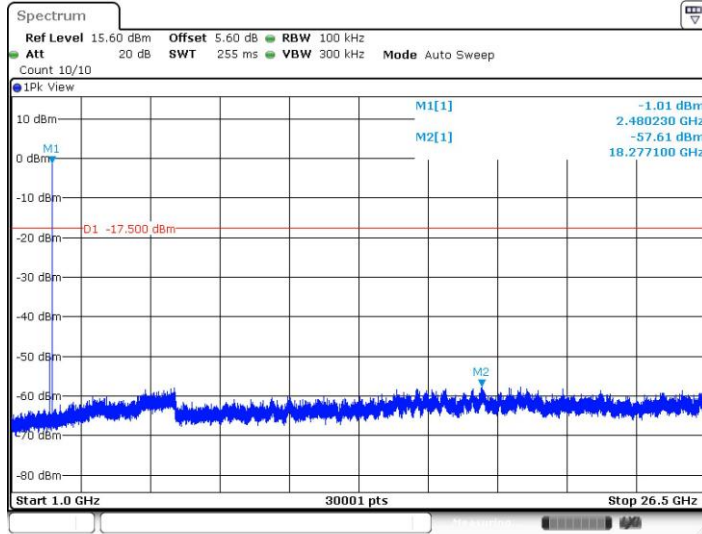




BLE_2M_Ant2_2480_30~1000



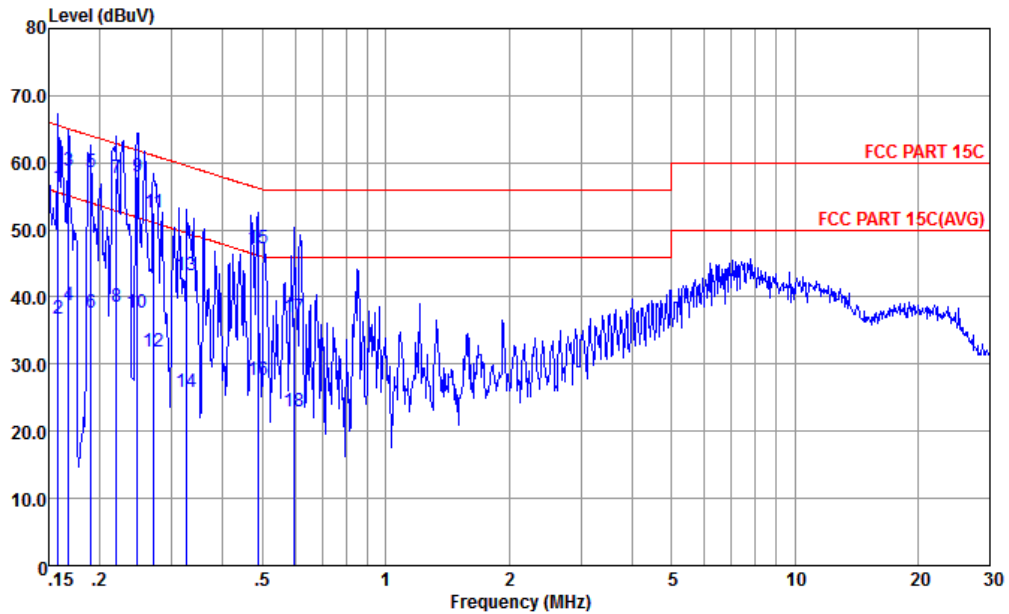
BLE_2M_Ant2_2480_1000~26500





Appendix B. AC Conducted Emission Test Results

Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		

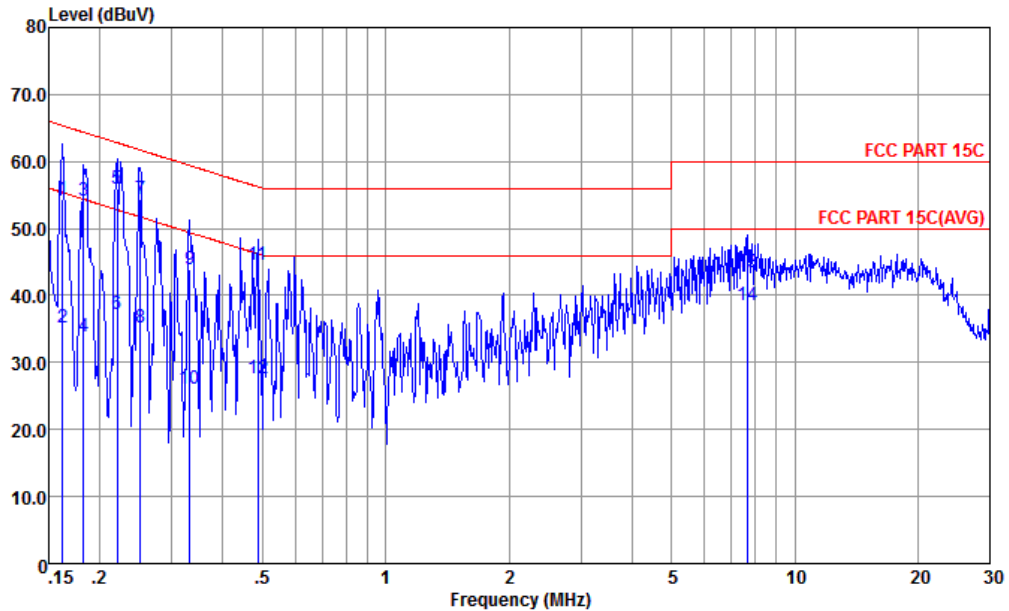


Site : CO01-KS
 Condition : FCC PART 15C LISN-L-060105-CN02 LINE

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.158	56.43	-9.13	65.56	45.90	0.07	10.46	QP
2	0.158	36.85	-18.71	55.56	26.32	0.07	10.46	Average
3	0.168	58.81	-6.27	65.08	48.30	0.08	10.43	QP
4	0.168	38.71	-16.37	55.08	28.20	0.08	10.43	Average
5	0.190	58.57	-5.45	64.02	48.11	0.08	10.38	QP
6	0.190	37.57	-16.45	54.02	27.11	0.08	10.38	Average
7	0.220	57.64	-5.19	62.83	47.20	0.09	10.35	QP
8	0.220	38.54	-14.29	52.83	28.10	0.09	10.35	Average
9 *	0.247	58.03	-3.83	61.86	47.59	0.10	10.34	QP
10	0.247	37.73	-14.13	51.86	27.29	0.10	10.34	Average
11	0.272	52.62	-8.45	61.07	42.20	0.10	10.32	QP
12	0.272	31.92	-19.15	51.07	21.50	0.10	10.32	Average
13	0.327	43.21	-16.32	59.53	32.81	0.11	10.29	QP
14	0.327	25.91	-23.62	49.53	15.51	0.11	10.29	Average
15	0.486	47.17	-9.06	56.23	36.80	0.13	10.24	QP
16	0.486	27.57	-18.66	46.23	17.20	0.13	10.24	Average
17	0.598	36.98	-19.02	56.00	26.60	0.14	10.24	QP
18	0.598	22.88	-23.12	46.00	12.50	0.14	10.24	Average



Test Engineer :	Amos Zhang	Temperature :	25.3~26.2°C
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
 Condition : FCC PART 15C LISN-N-060105-CN02 NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.162	54.40	-10.94	65.34	43.80	0.15	10.45	QP
2	0.162	35.10	-20.24	55.34	24.50	0.15	10.45	Average
3	0.182	54.16	-10.21	64.37	43.60	0.16	10.40	QP
4	0.182	33.86	-20.51	54.37	23.30	0.16	10.40	Average
5 *	0.221	56.02	-6.77	62.79	45.50	0.17	10.35	QP
6	0.221	37.12	-15.67	52.79	26.60	0.17	10.35	Average
7	0.251	54.32	-7.41	61.73	43.81	0.18	10.33	QP
8	0.251	35.32	-16.41	51.73	24.81	0.18	10.33	Average
9	0.332	43.99	-15.41	59.40	33.50	0.20	10.29	QP
10	0.332	25.99	-23.41	49.40	15.50	0.20	10.29	Average
11	0.486	44.67	-11.56	56.23	34.20	0.23	10.24	QP
12	0.486	27.67	-18.56	46.23	17.20	0.23	10.24	Average
13	7.646	43.55	-16.45	60.00	32.21	1.03	10.31	QP
14	7.646	38.45	-11.55	50.00	27.11	1.03	10.31	Average

Note:

- Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
- Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)



Appendix C. Radiated Spurious Emission

For Bluetooth LE 1Mbps

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE ANT1	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)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 00 2402MHz		2369.41	52.94	-21.06	74	49.5	30.48	7.69	34.73	153	304	P	H
		2374.22	42.95	-11.05	54	39.51	30.48	7.69	34.73	153	304	A	H
	*	2402	95.03	-	-	91.52	30.5	7.72	34.71	153	304	P	H
	*	2402	94.57	-	-	91.06	30.5	7.72	34.71	153	304	A	H
		2324.82	53.06	-20.94	74	49.81	30.43	7.6	34.78	393	37	P	V
		2347.57	42.92	-11.08	54	39.6	30.45	7.63	34.76	393	37	A	V
	*	2402	92.09	-	-	88.58	30.5	7.72	34.71	393	37	P	V
	*	2402	91.71	-	-	88.2	30.5	7.72	34.71	393	37	A	V
BLE CH 39 2480MHz		2486.56	53.28	-20.72	74	49.19	30.86	7.86	34.63	198	313	P	H
		2483.62	43.64	-10.36	54	39.55	30.86	7.86	34.63	198	313	A	H
	*	2480	90.92	-	-	86.83	30.86	7.86	34.63	198	313	P	H
	*	2480	90.39	-	-	86.3	30.86	7.86	34.63	198	313	A	H
		2496.64	53.7	-20.3	74	49.48	30.93	7.89	34.6	297	31	P	V
		2490.7	43.5	-10.5	54	39.28	30.93	7.89	34.6	297	31	A	V
	*	2480	88.68	-	-	84.59	30.86	7.86	34.63	297	31	P	V
	*	2480	88.13	-	-	84.04	30.86	7.86	34.63	297	31	A	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)

Table with 14 columns: BLE ANT1, 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). Rows include BLE CH 00 2402MHz and BLE CH 19 2440MHz.

Remark
1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
ANT2				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)
BLE CH 00 2402MHz		2345.62	52.65	-21.35	74	49.33	30.45	7.63	34.76	235	328	P	H
		2332.23	42.73	-11.27	54	39.48	30.43	7.6	34.78	235	328	A	H
	*	2402	85.9	-	-	82.39	30.5	7.72	34.71	235	328	P	H
	*	2402	85.43	-	-	81.92	30.5	7.72	34.71	235	328	A	H
		2336.26	52.55	-21.45	74	49.23	30.45	7.63	34.76	334	5	P	V
		2372.27	42.68	-11.32	54	39.24	30.48	7.69	34.73	334	5	A	V
	*	2402	84.5	-	-	80.99	30.5	7.72	34.71	334	5	P	V
	*	2402	83.84	-	-	80.33	30.5	7.72	34.71	334	5	A	V
BLE CH 39 2480MHz		2488.84	53.94	-20.06	74	49.75	30.93	7.89	34.63	221	318	P	H
		2496.82	43.57	-10.43	54	39.35	30.93	7.89	34.6	221	318	A	H
	*	2480	84.69	-	-	80.6	30.86	7.86	34.63	221	318	P	H
	*	2480	84.02	-	-	79.93	30.86	7.86	34.63	221	318	A	H
		2494.36	53.35	-20.65	74	49.13	30.93	7.89	34.6	388	351	P	V
		2496.34	43.43	-10.57	54	39.21	30.93	7.89	34.6	388	351	A	V
	*	2480	83.62	-	-	79.53	30.86	7.86	34.63	388	351	P	V
	*	2480	82.83	-	-	78.74	30.86	7.86	34.63	388	351	A	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)

Table with 14 columns: BLE ANT2, 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). Rows include BLE CH 00 2402MHz and BLE CH 19 2440MHz.

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	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)
2.4GHz BLE LF		44.55	23.39	-16.61	40	37.97	17.3	1.02	32.9	200	360	P	H
		209.45	20.43	-23.07	43.5	34.43	16.9	2.2	33.1	-	-	P	H
		423.82	23.04	-22.96	46	29.52	23.13	3.14	32.75	-	-	P	H
		614.91	25.81	-20.19	46	28.97	25.62	3.78	32.56	-	-	P	H
		726.46	26.78	-19.22	46	29.29	26.12	4.12	32.75	-	-	P	H
		821.52	27.2	-18.8	46	28.33	27.03	4.38	32.54	-	-	P	H
		43.58	34.18	-5.82	40	48.24	17.82	1	32.88	100	0	P	V
		66.86	20.3	-19.7	40	38.87	13.26	1.23	33.06	-	-	P	V
		175.5	20.14	-23.36	43.5	34.19	16.89	2.01	32.95	-	-	P	V
		366.59	22.03	-23.97	46	30.15	21.83	2.92	32.87	-	-	P	V
		612	25.66	-20.34	46	28.84	25.59	3.78	32.55	-	-	P	V
		839.95	27.35	-18.65	46	28.37	27.14	4.42	32.58	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For Bluetooth LE 2Mbps

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE 1	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)
BLE CH 00 2402MHz		2368.37	52.64	-21.36	74	49.25	30.46	7.66	34.73	126	309	P	H
		2351.86	43.53	-10.47	54	40.17	30.46	7.66	34.76	126	309	A	H
	*	2402	95.27	-	-	91.76	30.5	7.72	34.71	126	309	P	H
	*	2402	93.89	-	-	90.38	30.5	7.72	34.71	126	309	A	H
		2358.88	52.5	-21.5	74	49.14	30.46	7.66	34.76	391	36	P	V
		2375.26	43.42	-10.58	54	39.98	30.48	7.69	34.73	391	36	A	V
	*	2402	91.9	-	-	88.39	30.5	7.72	34.71	391	36	P	V
	*	2402	90.6	-	-	87.09	30.5	7.72	34.71	391	36	A	V
BLE CH 39 2480MHz		2483.74	53.44	-20.56	74	49.35	30.86	7.86	34.63	281	314	P	H
		2493.76	44.25	-9.75	54	40.03	30.93	7.89	34.6	281	314	A	H
	*	2480	90.92	-	-	86.83	30.86	7.86	34.63	281	314	P	H
	*	2480	89.48	-	-	85.39	30.86	7.86	34.63	281	314	A	H
		2493.04	53.28	-20.72	74	49.06	30.93	7.89	34.6	369	31	P	V
		2490.82	44.16	-9.84	54	39.94	30.93	7.89	34.6	369	31	A	V
	*	2480	87.78	-	-	83.69	30.86	7.86	34.63	369	31	P	V
	*	2480	86.45	-	-	82.36	30.86	7.86	34.63	369	31	A	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)

Table with 14 columns: BLE 1, 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). Rows include BLE CH 00 2402MHz and BLE CH 19 2440MHz.

Remark
1. No other spurious found.
2. All results are PASS against Peak and Average limit line.



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
2				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)
BLE CH 00 2402MHz		2353.81	52.47	-21.53	74	49.11	30.46	7.66	34.76	188	332	P	H
		2369.8	43.37	-10.63	54	39.93	30.48	7.69	34.73	188	332	A	H
	*	2402	86.18	-	-	82.67	30.5	7.72	34.71	188	332	P	H
	*	2402	84.88	-	-	81.37	30.5	7.72	34.71	188	332	A	H
		2310.78	52.72	-21.28	74	49.51	30.41	7.58	34.78	333	5	P	V
		2374.74	43.41	-10.59	54	39.97	30.48	7.69	34.73	333	5	A	V
	*	2402	84.3	-	-	80.79	30.5	7.72	34.71	333	5	P	V
	*	2402	82.77	-	-	79.26	30.5	7.72	34.71	333	5	A	V
BLE CH 39 2480MHz		2486.02	54.25	-19.75	74	50.16	30.86	7.86	34.63	221	317	P	H
		2488.12	44.03	-9.97	54	39.84	30.93	7.89	34.63	221	317	A	H
	*	2480	85	-	-	80.91	30.86	7.86	34.63	221	317	P	H
	*	2480	83.55	-	-	79.46	30.86	7.86	34.63	221	317	A	H
		2496.94	53.06	-20.94	74	48.84	30.93	7.89	34.6	283	339	P	V
		2498.32	44.07	-9.93	54	39.85	30.93	7.89	34.6	283	339	A	V
	*	2480	81.5	-	-	77.41	30.86	7.86	34.63	283	339	P	V
	*	2480	80.15	-	-	76.06	30.86	7.86	34.63	283	339	A	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 2	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)
BLE CH 00 2402MHz		4806	41.52	-32.48	74	55.8	34.58	11.18	60.04	300	0	P	H
		4806	42.08	-31.92	74	56.36	34.58	11.18	60.04	300	0	P	V
BLE CH 19 2440MHz		4878	41.44	-32.56	74	55.5	34.69	11.28	60.03	300	0	P	H
		7320	43.96	-30.04	74	54.08	36.67	13.73	60.52	300	0	P	H
		4878	41.69	-32.31	74	55.75	34.69	11.28	60.03	300	0	P	V
		7320	43.19	-30.81	74	53.31	36.67	13.73	60.52	300	0	P	V
BLE CH 39 2480MHz		4962	42.28	-31.72	74	56.08	34.82	11.39	60.01	300	0	P	H
		7440	43.43	-30.57	74	53.5	36.62	13.85	60.54	300	0	P	H
		4962	42.23	-31.77	74	56.03	34.82	11.39	60.01	300	0	P	V
		7440	44.59	-29.41	74	54.66	36.62	13.85	60.54	300	0	P	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	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		44.55	23.53	-16.47	40	38.11	17.3	1.02	32.9	200	0	P	H
		119.24	16.46	-27.04	43.5	29.8	17.87	1.65	32.86	-	-	P	H
		158.04	19.58	-23.92	43.5	33.21	17.31	1.91	32.85	-	-	P	H
		208.48	19.75	-23.75	43.5	33.81	16.84	2.2	33.1	-	-	P	H
		326.82	23.64	-22.36	46	32.94	20.85	2.75	32.9	-	-	P	H
		576.11	26.12	-19.88	46	29.32	25.69	3.66	32.55	-	-	P	H
		42.61	31.76	-8.24	40	45.29	18.34	0.99	32.86	100	360	P	V
		64.92	17.3	-22.7	40	35.89	13.3	1.21	33.1	-	-	P	V
		174.53	20.3	-23.2	43.5	34.33	16.91	2.01	32.95	-	-	P	V
		457.77	23.96	-22.04	46	29.67	23.74	3.27	32.72	-	-	P	V
		627.52	26.2	-19.8	46	29.27	25.72	3.82	32.61	-	-	P	V
		765.26	27.97	-18.03	46	29.76	26.62	4.23	32.64	-	-	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:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE 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)

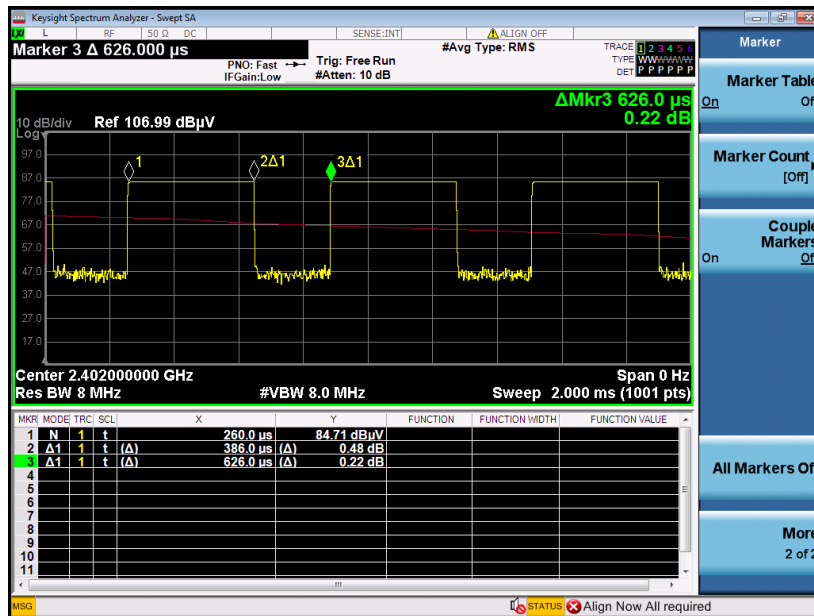
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1Mbps	61.66	0.386	2.591	2.7kHz
Bluetooth LE 2Mbps	32.37	0.202	4.950	5.1kHz

Bluetooth LE 1Mbps





Bluetooth LE 2Mbps

