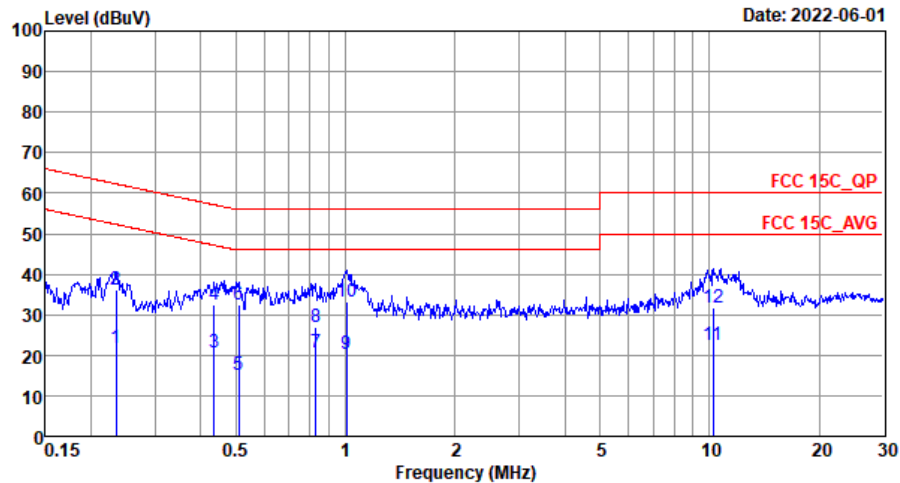


Test Engineer :	Lily	Temperature :	22~25°C
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20210901_N NEUTRAL

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.23	21.91	-30.39	52.30	1.20	10.26	10.45	Average
2	0.23	36.01	-26.29	62.30	15.30	10.26	10.45	QP
3	0.44	20.79	-26.36	47.15	-1.00	10.19	11.60	Average
4	0.44	32.49	-24.66	57.15	10.70	10.19	11.60	QP
5	0.51	15.10	-30.90	46.00	-6.90	10.20	11.80	Average
6	0.51	32.50	-23.50	56.00	10.50	10.20	11.80	QP
7	0.83	20.49	-25.51	46.00	-0.40	10.22	10.67	Average
8	0.83	26.79	-29.21	56.00	5.90	10.22	10.67	QP
9	1.00	20.25	-25.75	46.00	-0.20	10.22	10.23	Average
10 *	1.00	33.15	-22.85	56.00	12.70	10.22	10.23	QP
11	10.23	22.49	-27.51	50.00	2.20	9.99	10.30	Average
12	10.23	31.69	-28.31	60.00	11.40	9.99	10.30	QP

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_Ant.1

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	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)
BT CH00 2402MHz		2385.075	49.95	-24.05	74	40.99	32.03	9.63	32.7	111	33	P	H
		2385.075	25.16	-28.84	54	-	-	-	-	-	-	A	H
	*	2402	108.93	-	-	99.98	32	9.65	32.7	111	33	P	H
	*	2402	84.14	-	-	-	-	-	-	-	-	A	H
		2362.815	48.91	-25.09	74	39.93	32.07	9.61	32.7	144	324	P	V
		2362.815	24.12	-29.88	54	-	-	-	-	-	-	A	V
	*	2402	108.07	-	-	99.12	32	9.65	32.7	144	324	P	V
	*	2402	83.28	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2365.02	48.73	-25.27	74	39.75	32.07	9.61	32.7	110	49	P	H
		2365.02	23.94	-30.06	54	-	-	-	-	-	-	A	H
	*	2441	110.29	-	-	100.99	32.3	9.7	32.7	110	49	P	H
	*	2441	85.5	-	-	-	-	-	-	-	-	A	H
		2497.69	47.89	-26.11	74	38.72	32.1	9.77	32.7	110	49	P	H
		2497.69	23.1	-30.9	54	-	-	-	-	-	-	A	H
		2386.3	48.84	-25.16	74	39.91	32	9.63	32.7	138	324	P	V
		2386.3	24.05	-29.95	54	-	-	-	-	-	-	A	V
	*	2441	107.62	-	-	98.32	32.3	9.7	32.7	138	324	P	V
	*	2441	82.83	-	-	-	-	-	-	-	-	A	V
		2498.32	49.07	-24.93	74	39.9	32.1	9.77	32.7	138	324	P	V
		2498.32	24.28	-29.72	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	108.7	-	-	99.48	32.17	9.75	32.7	100	49	P	H
	*	2480	83.91	-	-	-	-	-	-	-	-	A	H
		2483.6	51.55	-22.45	74	42.33	32.17	9.75	32.7	100	49	P	H
		2483.6	26.76	-27.24	54	-	-	-	-	-	-	A	H
	*	2480	107.44	-	-	98.22	32.17	9.75	32.7	123	327	P	V
	*	2480	82.65	-	-	-	-	-	-	-	-	A	V
		2483.76	51.16	-22.84	74	41.94	32.17	9.75	32.7	123	327	P	V
		2483.76	26.37	-27.63	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	Level	Margin	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 CH 00 2402MHz		4804	45.44	-28.56	74	51.69	33.9	12	52.15	-	-	P	H
		4804	20.65	-33.35	54	-	-	-	-	-	-	A	H
		4804	45.25	-28.75	74	51.5	33.9	12	52.15	-	-	P	V
		4804	20.46	-33.54	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	45.34	-28.66	74	51.66	33.73	12.05	52.1	-	-	P	H
		4882	20.55	-33.45	54	-	-	-	-	-	-	A	H
		7323	47.46	-26.54	74	49.29	35.77	14.17	51.77	-	-	P	H
		7323	22.67	-31.33	54	-	-	-	-	-	-	A	H
		4882	43.68	-30.32	74	50	33.73	12.05	52.1	-	-	P	V
		4882	18.89	-35.11	54	-	-	-	-	-	-	A	V
		7323	47.05	-26.95	74	48.88	35.77	14.17	51.77	-	-	P	V
		7323	22.26	-31.74	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	44.74	-29.26	74	50.95	33.73	12.09	52.03	-	-	P	H
		4960	19.95	-34.05	54	-	-	-	-	-	-	A	H
		7440	47.12	-26.88	74	48.74	35.79	14.24	51.65	-	-	P	H
		7440	22.33	-31.67	54	-	-	-	-	-	-	A	H
		4960	44.23	-29.77	74	50.44	33.73	12.09	52.03	-	-	P	V
		4960	19.44	-34.56	54	-	-	-	-	-	-	A	V
		7440	47.55	-26.45	74	49.17	35.79	14.24	51.65	-	-	P	V
		7440	22.76	-31.24	54	-	-	-	-	-	-	A	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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	Line (dBμV/m)	Level (dBμV)	Factor (dB/m)	Loss (dB)	Factor (dB)	Pos (cm)	Pos (deg)	Avg. (P/A)	(H/V)
2.4GHz BT LF		30	24.75	-15.25	40	29.84	25.2	1.01	31.3	-	-	P	H
		54.25	22.96	-17.04	40	39.63	13.58	1.35	31.6	-	-	P	H
		122.15	22.94	-20.56	43.5	34.28	18.16	2.01	31.51	-	-	P	H
		316.15	25.74	-20.26	46	34.15	19.76	3.2	31.37	-	-	P	H
		521.79	28.38	-17.62	46	31.26	24.26	4.11	31.25	-	-	P	H
		638.19	29.92	-16.08	46	31.69	25.13	4.55	31.45	-	-	P	H
		37.76	30.88	-9.12	40	40.71	20.44	1.13	31.4	-	-	P	V
		53.28	28.5	-11.5	40	45	13.76	1.34	31.6	-	-	P	V
		88.2	20.23	-23.27	43.5	35.28	14.74	1.71	31.5	-	-	P	V
		259.89	21.9	-24.1	46	30.44	20.2	2.91	31.65	-	-	P	V
		438.37	25.42	-20.58	46	30.38	22.75	3.77	31.48	-	-	P	V
		615.88	29.65	-16.35	46	31.72	24.99	4.48	31.54	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For Bluetooth_Ant.2

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	Avg.	
BT CH00 2402MHz		2388.75	48.79	-25.21	74	39.85	32	9.64	32.7	109	26	P	H
		2388.75	24	-30	54	-	-	-	-	-	-	A	H
	*	2402	108.62	-	-	99.67	32	9.65	32.7	109	26	P	H
	*	2402	83.83	-	-	-	-	-	-	-	-	A	H
		2385.6	49.22	-24.78	74	40.29	32	9.63	32.7	146	322	P	V
		2385.6	24.43	-29.57	54	-	-	-	-	-	-	A	V
	*	2402	106.57	-	-	97.62	32	9.65	32.7	146	322	P	V
	*	2402	81.78	-	-	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		2311.4	49.19	-24.81	74	40.45	31.9	9.54	32.7	110	32	P	H
		2311.4	24.4	-29.6	54	-	-	-	-	-	-	A	H
	*	2441	108.64	-	-	99.34	32.3	9.7	32.7	110	32	P	H
	*	2441	83.85	-	-	-	-	-	-	-	-	A	H
		2487.4	48.97	-25.03	74	39.75	32.17	9.75	32.7	110	32	P	H
		2487.4	24.18	-29.82	54	-	-	-	-	-	-	A	H
		2388.96	48.28	-25.72	74	39.34	32	9.64	32.7	166	324	P	V
		2388.96	23.49	-30.51	54	-	-	-	-	-	-	A	V
	*	2441	105.18	-	-	95.88	32.3	9.7	32.7	166	324	P	V
	*	2441	80.39	-	-	-	-	-	-	-	-	A	V
		2500	48.34	-25.66	74	39.17	32.1	9.77	32.7	166	324	P	V
		2500	23.55	-30.45	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz	*	2480	107.6	-	-	98.38	32.17	9.75	32.7	106	28	P	H
	*	2480	82.81	-	-	-	-	-	-	-	-	A	H
		2483.52	51.89	-22.11	74	42.67	32.17	9.75	32.7	106	28	P	H
		2483.52	27.1	-26.9	54	-	-	-	-	-	-	A	H
	*	2480	105.65	-	-	96.43	32.17	9.75	32.7	121	324	P	V
	*	2480	80.86	-	-	-	-	-	-	-	-	A	V
		2486.28	49.2	-24.8	74	39.98	32.17	9.75	32.7	121	324	P	V
		2486.28	24.41	-29.59	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	Level	Margin	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 CH 00 2402MHz		4804	45.52	-28.48	74	51.77	33.9	12	52.15	-	-	P	H
		4804	20.73	-33.27	54	-	-	-	-	-	-	A	H
		4804	45.43	-28.57	74	51.68	33.9	12	52.15	-	-	P	V
		4804	20.64	-33.36	54	-	-	-	-	-	-	A	V
BT CH 39 2441MHz		4882	45.35	-28.65	74	51.67	33.73	12.05	52.1	-	-	P	H
		4882	20.56	-33.44	54	-	-	-	-	-	-	A	H
		7323	47.42	-26.58	74	49.25	35.77	14.17	51.77	-	-	P	H
		7323	22.63	-31.37	54	-	-	-	-	-	-	A	H
		4882	44.24	-29.76	74	50.56	33.73	12.05	52.1	-	-	P	V
		4882	19.45	-34.55	54	-	-	-	-	-	-	A	V
		7323	47.54	-26.46	74	49.37	35.77	14.17	51.77	-	-	P	V
		7323	22.75	-31.25	54	-	-	-	-	-	-	A	V
BT CH 78 2480MHz		4960	44.69	-29.31	74	50.9	33.73	12.09	52.03	-	-	P	H
		4960	19.9	-34.1	54	-	-	-	-	-	-	A	H
		7440	47.12	-26.88	74	48.74	35.79	14.24	51.65	-	-	P	H
		7440	22.33	-31.67	54	-	-	-	-	-	-	A	H
		4960	44.62	-29.38	74	50.83	33.73	12.09	52.03	-	-	P	V
		4960	19.83	-34.17	54	-	-	-	-	-	-	A	V
		7440	47.41	-26.59	74	49.03	35.79	14.24	51.65	-	-	P	V
		7440	22.62	-31.38	54	-	-	-	-	-	-	A	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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	Factor	Loss	Factor	Pos	Pos	Avg.	
							(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		37.76	26.04	-13.96	40	35.87	20.44	1.13	31.4	-	-	P	H
		54.25	22.85	-17.15	40	39.52	13.58	1.35	31.6	-	-	P	H
		122.15	21.8	-21.7	43.5	33.14	18.16	2.01	31.51	-	-	P	H
		316.15	25.43	-20.57	46	33.84	19.76	3.2	31.37	-	-	P	H
		474.26	26.66	-19.34	46	30.74	23.34	3.92	31.34	-	-	P	H
		638.19	31.28	-14.72	46	33.05	25.13	4.55	31.45	-	-	P	H
		31.94	30.19	-9.81	40	36.71	24.04	1.04	31.6	-	-	P	V
		38.73	30.5	-9.5	40	40.93	19.82	1.15	31.4	-	-	P	V
		54.25	28.36	-11.64	40	45.03	13.58	1.35	31.6	-	-	P	V
		82.38	20.38	-19.62	40	36.62	13.66	1.65	31.55	-	-	P	V
		406.36	24.95	-21.05	46	30.68	22.05	3.63	31.41	-	-	P	V
		649.83	31.51	-14.49	46	33.12	25.2	4.59	31.4	-	-	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 Margin 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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					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. Margin (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. Margin (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. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

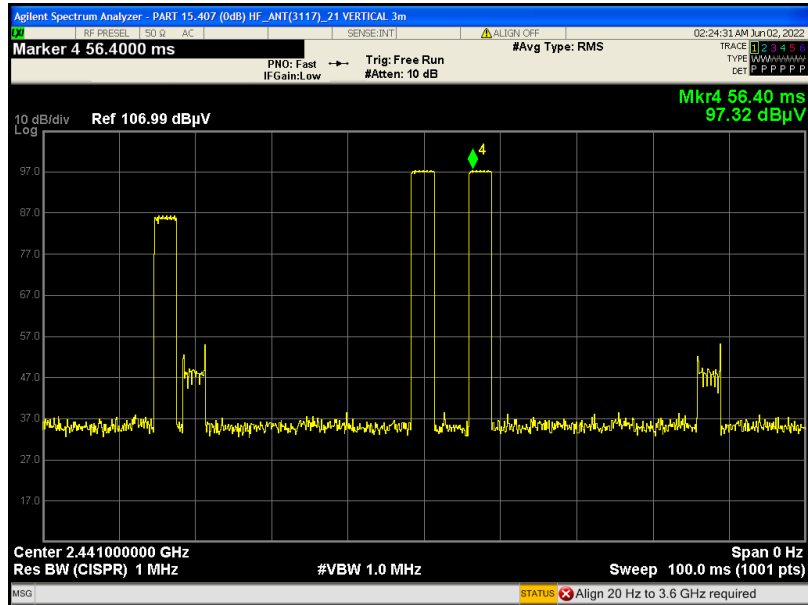
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

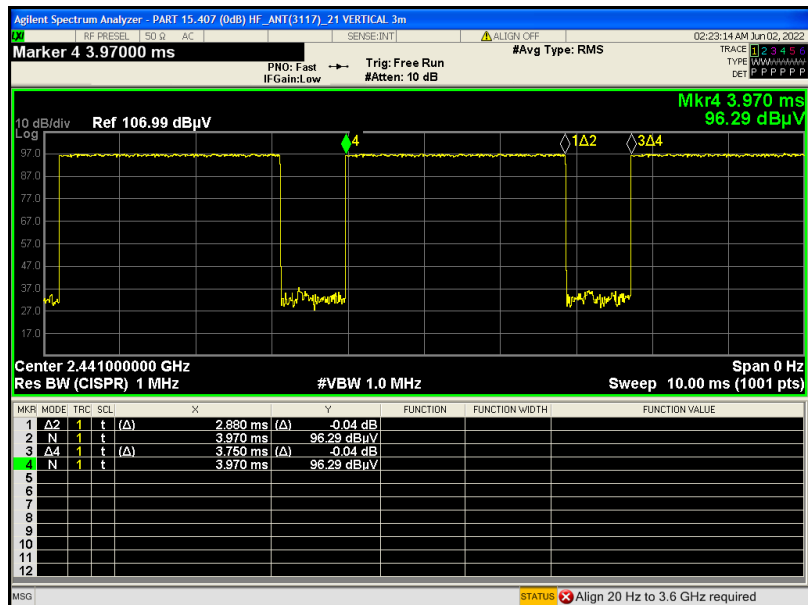
Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 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. 3DH5 has the highest duty cycle worst case and is reported.