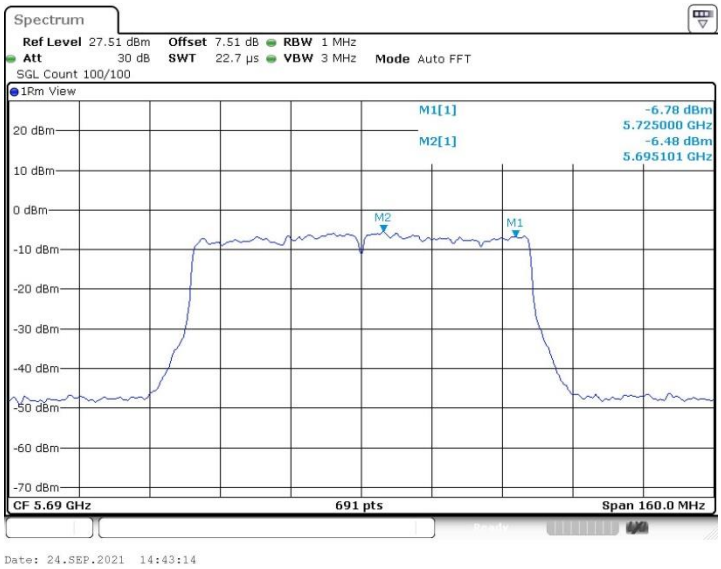
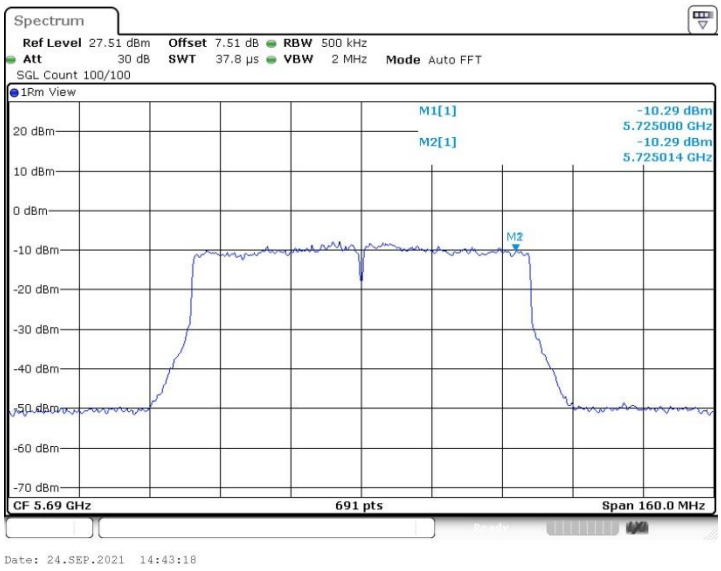
11AC80SISO_Ant1_5690-2C

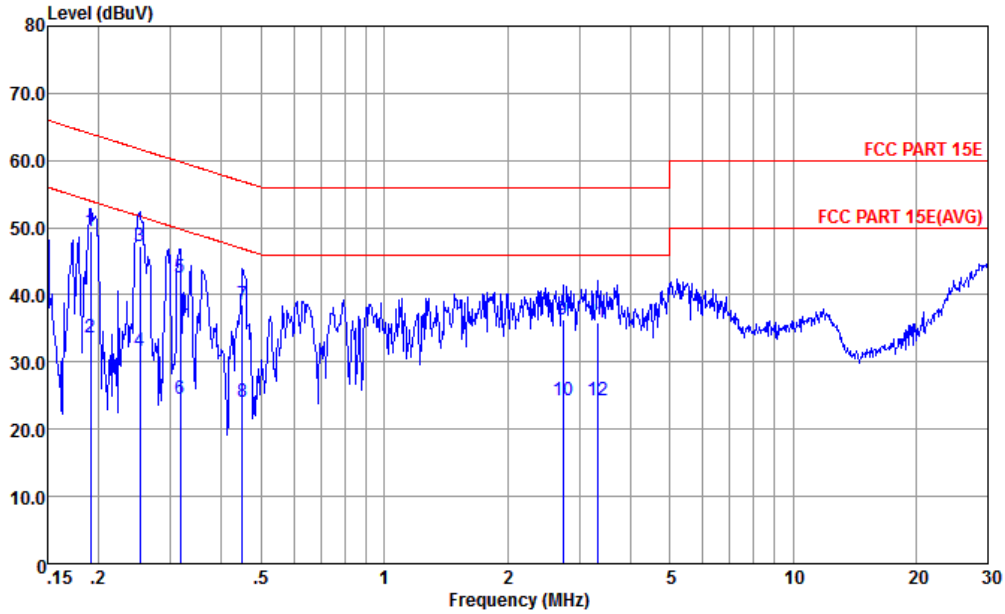


11AC80SISO_Ant1_5690-3



Appendix B. AC Conducted Emission Test Results

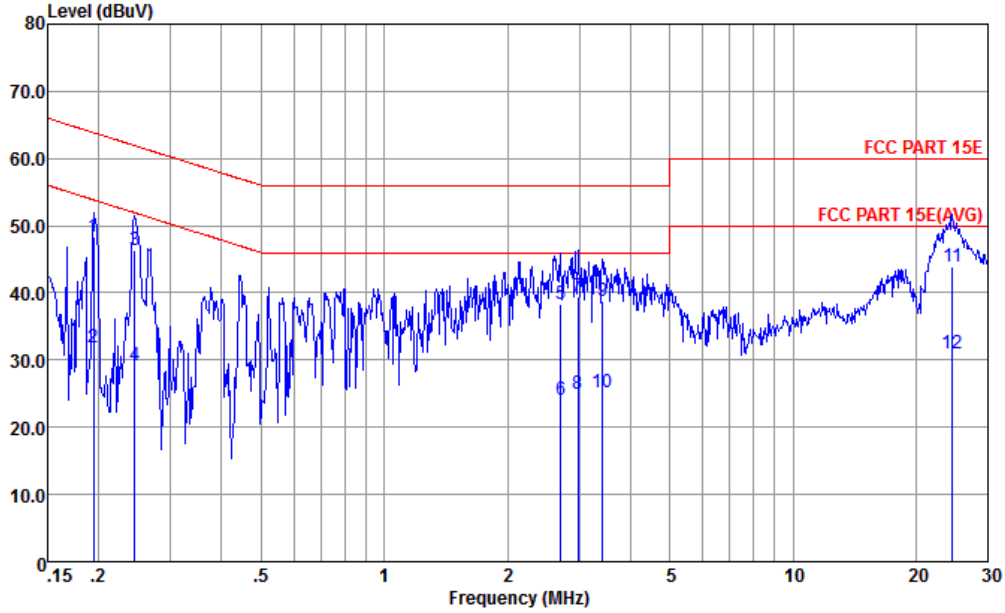
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



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

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.191	49.57	-14.41	63.98	39.11	0.08	10.38	QP
2		0.191	33.67	-20.31	53.98	23.21	0.08	10.38	Average
3	*	0.252	47.33	-14.36	61.69	36.90	0.10	10.33	QP
4		0.252	31.73	-19.96	51.69	21.30	0.10	10.33	Average
5		0.317	42.51	-17.29	59.80	32.10	0.11	10.30	QP
6		0.317	24.51	-25.29	49.80	14.10	0.11	10.30	Average
7		0.449	38.57	-18.32	56.89	28.19	0.13	10.25	QP
8		0.449	23.97	-22.92	46.89	13.59	0.13	10.25	Average
9		2.736	36.33	-19.67	56.00	25.60	0.49	10.24	QP
10		2.736	24.23	-21.77	46.00	13.50	0.49	10.24	Average
11		3.328	35.89	-20.11	56.00	25.10	0.54	10.25	QP
12		3.328	24.29	-21.71	46.00	13.50	0.54	10.25	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		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 15E LISN-N-060105-CN02 NEUTRAL

		Freq MHz	Level dBuV	Over Limit dB	Limit Line dBuV	Read Level dBuV	LISN Factor dB	Cable Loss dB	Remark
1		0.194	48.34	-15.50	63.84	37.80	0.17	10.37	QP
2		0.194	31.84	-22.00	53.84	21.30	0.17	10.37	Average
3	*	0.246	46.42	-15.49	61.91	35.90	0.18	10.34	QP
4		0.246	29.12	-22.79	51.91	18.60	0.18	10.34	Average
5		2.707	38.36	-17.64	56.00	27.50	0.62	10.24	QP
6		2.707	24.16	-21.84	46.00	13.30	0.62	10.24	Average
7		2.978	39.50	-16.50	56.00	28.61	0.65	10.24	QP
8		2.978	25.00	-21.00	46.00	14.11	0.65	10.24	Average
9		3.417	38.85	-17.15	56.00	27.90	0.70	10.25	QP
10		3.417	25.15	-20.85	46.00	14.20	0.70	10.25	Average
11		24.529	43.98	-16.02	60.00	30.20	3.22	10.56	QP
12		24.529	30.98	-19.02	50.00	17.20	3.22	10.56	Average

Note:

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

Appendix C. Radiated Spurious Emission

UNII 1 - 5150~5250MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac VHT80 CH 42 5210MHz		5144.96	56.84	-17.16	74	43.62	35.29	10.65	32.72	107	80	P	H
		5148.32	47.34	-6.66	54	34.12	35.29	10.65	32.72	107	80	A	H
	*	5218	94.29	-	-	80.93	35.33	10.72	32.69	107	80	P	H
		5218	87.43	-	-	74.07	35.33	10.72	32.69	107	80	A	H
		5353.02	54.11	-19.89	74	40.55	35.42	10.78	32.64	107	80	P	H
		5399.1	45.01	-8.99	54	31.38	35.45	10.81	32.63	107	80	A	H
		5147.68	56.37	-17.63	74	43.51	34.93	10.65	32.72	100	81	P	V
		5147.36	47.13	-6.87	54	34.27	34.93	10.65	32.72	100	81	A	V
	*	5218	96.27	-	-	83.25	34.99	10.72	32.69	100	81	P	V
		5218	88.98	-	-	75.96	34.99	10.72	32.69	100	81	A	V
		5395.14	53.81	-20.19	74	40.46	35.17	10.81	32.63	100	81	P	V
		5364.72	45.2	-8.8	54	31.91	35.14	10.79	32.64	100	81	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 1 5150~5250MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 42 5210MHz		10420	45.91	-22.39	68.3	53.65	38.62	15.41	61.77	300	0	P	H
		10420	45.42	-22.88	68.3	52.77	37.81	15.41	60.57	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 1 - 5150~5250MHz

UNII 2A - 5250~5350MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 58 5290MHz		5113.28	55.63	-18.37	74	42.5	35.26	10.61	32.74	100	75	P	H
		5105.92	46.3	-7.7	54	33.18	35.25	10.61	32.74	100	75	A	H
	*	5296	93.27	-	-	79.81	35.37	10.76	32.67	100	75	P	H
		5296	85.8	-	-	72.34	35.37	10.76	32.67	100	75	A	H
		5374.5	55.51	-18.49	74	41.93	35.43	10.79	32.64	100	75	P	H
		5361.9	45.99	-8.01	54	32.42	35.42	10.79	32.64	100	75	A	H
		5149.28	55.55	-18.45	74	42.69	34.93	10.65	32.72	100	83	P	V
		5126.08	46.06	-7.94	54	33.25	34.91	10.63	32.73	100	83	A	V
	*	5296	96.21	-	-	83.04	35.08	10.76	32.67	100	83	P	V
		5296	87.91	-	-	74.74	35.08	10.76	32.67	100	83	A	V
		5351	54.75	-19.25	74	41.5	35.12	10.78	32.65	100	83	P	V
		5350	47	-7	54	33.75	35.12	10.78	32.65	100	83	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2A 5250~5350MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 58 5290MHz		10580	45.39	-22.91	68.3	52.78	38.71	15.53	61.63	300	0	P	H
		10580	46.27	-22.03	68.3	53.38	37.93	15.53	60.57	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2A 5250~5350MHz

UNII 2C - 5470~5725MHz

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 106 5530MHz		5459.6	55.08	-18.92	74	41.31	35.48	10.89	32.6	121	71	P	H
		5469.04	54.38	-13.92	68.3	40.57	35.49	10.92	32.6	121	71	P	H
		5450.48	46.09	-7.91	54	32.32	35.48	10.89	32.6	121	71	A	H
	*	5518	94.81	-	-	80.9	35.51	11	32.6	121	71	P	H
		5518	87.4	-	-	73.49	35.51	11	32.6	121	71	A	H
		5726.36	55.01	-13.29	68.3	40.76	35.72	11.25	32.72	121	71	P	H
		5360.72	54.97	-19.03	74	41.68	35.14	10.79	32.64	107	96	P	V
		5467.76	56.6	-11.7	68.3	43.04	35.24	10.92	32.6	107	96	P	V
		5456.08	46.43	-7.57	54	32.92	35.22	10.89	32.6	107	96	A	V
	*	5524	96.38	-	-	82.69	35.29	11	32.6	107	96	P	V
		5524	89.17	-	-	75.48	35.29	11	32.6	107	96	A	V
		5764.2	54.87	-13.43	68.3	41.04	35.29	11.29	32.75	107	96	P	V
802.11ac VHT80 CH 122 5610MHz		5412.4	54.58	-19.42	74	40.91	35.45	10.84	32.62	115	72	P	H
		5466.96	54.38	-13.92	68.3	40.58	35.48	10.92	32.6	115	72	P	H
		5457.04	45.52	-8.48	54	31.75	35.48	10.89	32.6	115	72	A	H
	*	5602	94.43	-	-	80.37	35.57	11.13	32.64	115	72	P	H
		5602	86.85	-	-	72.79	35.57	11.13	32.64	115	72	A	H
		5729.56	55.12	-13.18	68.3	40.88	35.72	11.25	32.73	115	72	P	H
		5427.28	54.69	-19.31	74	41.27	35.19	10.84	32.61	102	95	P	V
		5469.36	53.79	-14.51	68.3	40.23	35.24	10.92	32.6	102	95	P	V
		5450	45.46	-8.54	54	31.95	35.22	10.89	32.6	102	95	A	V
	*	5614	94.95	-	-	81.11	35.37	11.13	32.66	102	95	P	V
		5614	88	-	-	74.16	35.37	11.13	32.66	102	95	A	V
		5740.12	55.1	-13.2	68.3	41.25	35.31	11.27	32.73	102	95	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2C 5470~5725MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 106 5530MHz		11060	45.89	-28.11	74	52.73	38.96	15.89	61.69	300	0	P	H
		11060	45.77	-28.23	74	52.11	38.28	15.89	60.51	100	360	P	V
802.11ac VHT80 CH 122 5610MHz		11220	45.62	-28.38	74	52.16	39.05	16.04	61.63	300	0	P	H
		11220	45.73	-28.27	74	51.8	38.39	16.04	60.5	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2C 5470~5725MHz

UNII 2C - Straddle Channel

WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11ac		5698	92.98	-	-	78.79	35.67	11.22	32.7	113	72	P	H
VHT80		5698	86.01	-	-	71.82	35.67	11.22	32.7	113	72	A	H
CH 138		5674	94.79	-	-	80.91	35.37	11.2	32.69	108	94	P	V
5690MHz		5674	87.84	-	-	73.96	35.37	11.2	32.69	108	94	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2C - Straddle Channel

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 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)
802.11ac VHT80 CH 138 5690MHz		11380	45.1	-28.9	74	51.31	39.14	16.21	61.56	300	0	P	H
		11380	46.11	-27.89	74	51.88	38.51	16.21	60.49	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

UNII 2C - Straddle Channel

Emission below 1GHz

5GHz WIFI 802.11ac VHT80 (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
5GHz 802.11ac VHT80 LF		119.24	30.42	-13.08	43.5	44.95	16.56	1.77	32.86	-	-	P	H
		218.18	29.97	-16.03	46	44.4	16.28	2.39	33.1	-	-	P	H
		260.86	27.75	-18.25	46	39.53	18.67	2.61	33.06	-	-	P	H
		651.77	29.03	-16.97	46	30.87	26.7	4.16	32.7	-	-	P	H
		829.28	32.94	-13.06	46	30.72	28.81	4.69	31.28	-	-	P	H
		940.83	32.29	-13.71	46	29.78	29.85	5	32.34	-	-	P	H
		42.61	27.62	-12.38	40	40.39	18.12	0.77	31.66	-	-	P	V
		86.26	27.25	-12.75	40	44.33	14.26	1.42	32.76	-	-	P	V
		221.09	32.28	-13.72	46	46.5	16.48	2.4	33.1	-	-	P	V
		266.68	29.61	-16.39	46	41.23	18.77	2.64	33.03	-	-	P	V
		814.73	31.02	-14.98	46	30.3	28.61	4.64	32.53	-	-	P	V
		908.82	32.64	-13.36	46	30.69	29.5	4.91	32.46	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

For Co-location:

WIFI 802.11ac80 CH42 TX + BLE_CH39 TX + LTE B48 16QAM 20M Link

(Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
WIFI 802.11ac80 CH42 TX + BLE_CH39 TX + LTE B48 16QAM 20M Link		2483.5	55.25	-18.75	74	49.61	31.8	7.27	33.43	100	129	P	H
		2483.5	46.43	-7.57	54	40.79	31.8	7.27	33.43	100	129	A	H
	*	2480	95.22	-	-	89.58	31.8	7.27	33.43	100	129	P	H
		2480	93.75	-	-	88.11	31.8	7.27	33.43	100	129	A	H
		2497.72	55.04	-18.96	74	48.43	32.73	7.3	33.42	400	216	P	V
		2483.5	46.44	-7.56	54	39.74	32.86	7.27	33.43	400	216	A	V
		2480	91.95	-	-	85.25	32.86	7.27	33.43	400	216	P	V
		2480	90.54	-	-	83.84	32.86	7.27	33.43	400	216	A	V
	*	5127.36	56.51	-17.49	74	43.33	35.28	10.63	32.73	100	255	P	H
		5118.24	46.61	-7.39	54	33.47	35.26	10.61	32.73	100	255	A	H
		5218	89.67	-	-	76.31	35.33	10.72	32.69	100	255	P	H
		5218	82.27	-	-	68.91	35.33	10.72	32.69	100	255	A	H
		5367.96	54.16	-19.84	74	40.58	35.43	10.79	32.64	100	255	P	H
		5396.04	45.11	-8.89	54	31.49	35.44	10.81	32.63	100	255	A	H
		5103.2	54.89	-19.11	74	42.16	34.88	10.59	32.74	100	268	P	V
		5148.48	46.24	-7.76	54	33.38	34.93	10.65	32.72	100	268	A	V
		5206	90.65	-	-	77.66	34.98	10.71	32.7	100	268	P	V
		5206	84.05	-	-	71.06	34.98	10.71	32.7	100	268	A	V
		5389.56	53.93	-20.07	74	40.6	35.16	10.8	32.63	100	268	P	V
		5365.44	44.97	-9.03	54	31.68	35.14	10.79	32.64	100	268	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI 802.11ac80 CH42 TX + BLE_CH39 TX + LTE B48 16QAM 20M Link

(Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
WIFI 802.11ac80 CH42 TX + BLE_CH39 TX + LTE B48 16QAM 20M Link		4962	40.57	-33.43	74	56.71	35.14	10.43	61.71	100	360	P	H
		7440	43.09	-30.91	74	55.39	36.89	12.88	62.07	100	360	P	H
		4962	41.09	-32.91	74	57.56	34.81	10.43	61.71	100	360	P	V
		7440	41.8	-32.2	74	54.52	36.47	12.88	62.07	100	360	P	V
		10418.42	44.03	-24.27	68.3	51.77	38.62	15.41	61.77	300	0	P	H
		10418.42	44.44	-23.86	68.3	51.89	37.81	15.41	60.67	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		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)

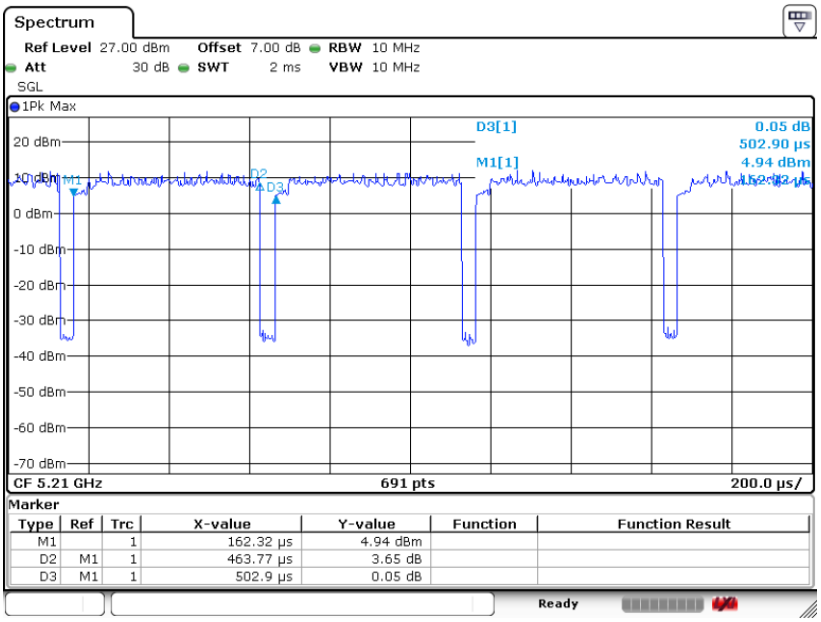
= -10.46(dB)

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
802.11ac VHT80	92.22	0.464	2.156	2.2KHz

802.11 ac VHT80



Date: 22.SEP.2021 22:46:22

Appendix F. Product Equality Declaration

MOTOROLA SOLUTIONS

Date: March 25, 2021

Product Equality Declaration

We, Motorola Solutions Malaysia Sdn Bhd, declare on our sole responsibility for the product of EVOLVE-i as below:
From hardware vintage P2.2 EVOLVE-i SKU to hardware vintage P3 EVOLVE-i SKU,

	Main Changes
1	Increase LDO as MIC_BIAS power supplier, to solve EU RED Cert-Radio Frequency, Common mode(CS) test issue.
2	Optimize GPS routing, from inner layer to bottom layer.
3	Due to above changes, the PCB will update the part number.
4	Add a new Battery

Except listings above, the others are all the same.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,

Contact Person: Mahen Kirubakaran
COMPANY: Motorola Solutions Malaysia Sdn Bhd
Tel: +60 (4) 2241218
Fax: N/A
E-Mail: mahen@motorolasolutions.com

Date: October 22, 2021

Product Equality Declaration

We, Motorola Solutions Inc. CORPORATION, declare on our sole responsibility for the product of EVOLVE and EVOLVE-i as below:

There is no difference between P3 and PVT HW version, and, the difference of EVOLVE-i and EVOLVE is RF section is same only with extra protection components in EVOLVE-i.

i) Both SKUs share the same PCB with all traces.

ii) EVOLVE-i SKU will have protection circuits with fuse and Zener diode (BOM different).

iii) EVOLVE SKU the fuse will become 0 ohm and Zener diodes will be not populated.

iv) The RF sections are the same for both EVOLVE-i and EVOLVE SKUs.

Except listings above, the others are all the same.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,

Contact Person: Hasrolnizam Bin Mohd Mokhtar

COMPANY: Motorola Solutions Malaysia Sdn Bhd

Tel: +60(4) 2241066

Fax: N/A

E-Mail: hasrolnizam.mohdmokhtar@motorolasolutions.com