



Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Jesse Wang, Stan Hsieh and Ken Wu	Temperature :	23~25°C
		Relative Humidity :	53~60%

Note symbol

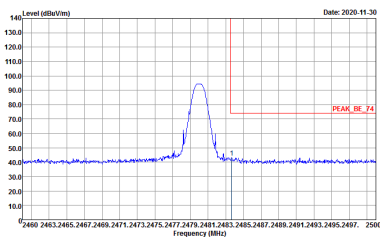
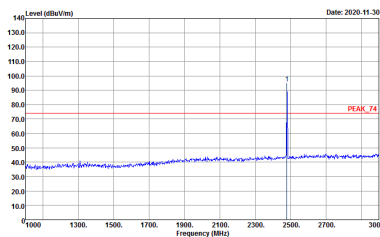
-L	Low channel location
-R	High channel location



<For SKU 1>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH07-4Y Condition : PEAK_BE_74 3m HF ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 19	 Site : 03CH07-4Y Condition : PEAK_74 3m HF ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 19



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	Level (dBuV/m) Date: 2020-11-30 PEAK BE 74 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 862115-01 19	Level (dBuV/m) Date: 2020-11-30 PEAK 74 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak Mode : 862115-01 19

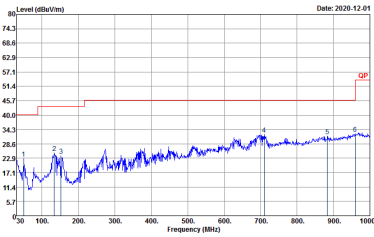
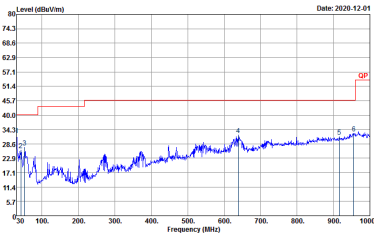


2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2020-11-30 Site : 03CH07-4Y Condition : PEAK_78.3m HF_ANT_00227880 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 19	Level (dBuV/m) Date: 2020-11-30 Site : 03CH07-4Y Condition : PEAK_78.3m HF_ANT_00227880 VERTICAL Detector : Peak Project : 862115-01 Mode : 19

Emission below 1GHz
2.4GHz BT (LF)

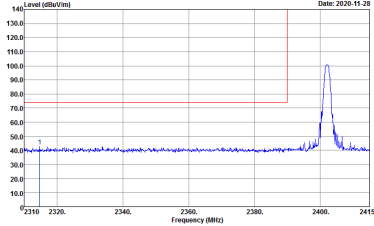
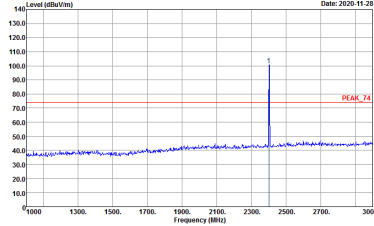
BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) HORIZONTAL Detector : Peak Project : 862115-01 Mode : 20	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) VERTICAL Detector : Peak Project : 862115-01 Mode : 20



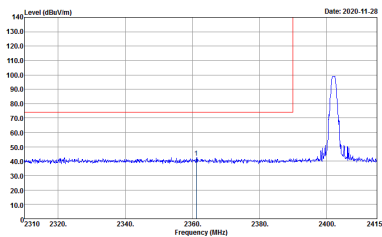
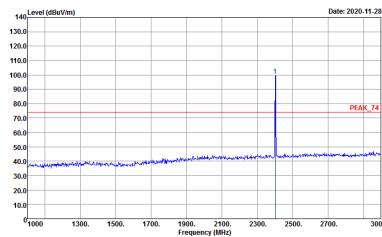
<For SKU 2>

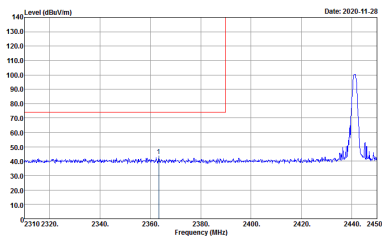
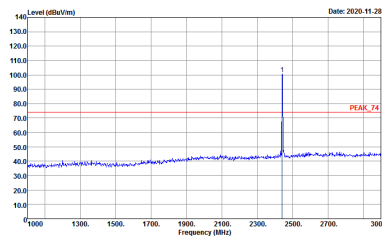
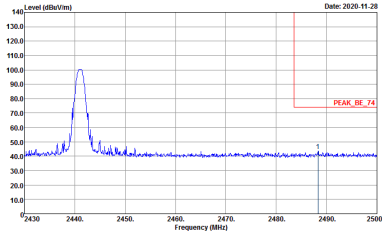
2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

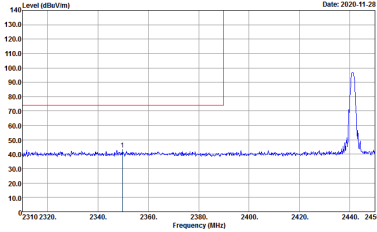
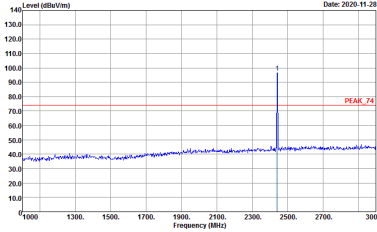
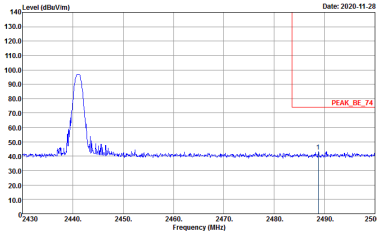
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH07-4Y Condition : PEAK_86_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 862115-01 Mode : 1	 Site : 03CH07-4Y Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 862115-01 Mode : 1



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH07-01 Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 1	 Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 1

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 2	 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 2
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 2	Left blank



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 2	 Site : 03CH07-HY Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 2
Peak	 Site : 03CH07-HY Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 2	Left blank



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak	Level (dBuV/m) Date: 2020-11-28 2460 2463.2465.2467.2469.2471.2473.2475.2477.2479.2481.2483.2485.2487.2489.2491.2493.2495.2497. 2500 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 3	Level (dBuV/m) Date: 2020-11-28 1000 1300. 1500. 1700. 1900. 2100. 2300. 2500. 2700. 3000 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 3



BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak	Level (dBuV/m) Date: 2020-11-28 PEAK BE 74 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 862115-01 Mode : 3	Level (dBuV/m) Date: 2020-11-28 PEAK 74 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 862115-01 Mode : 3



2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2020-11-29 Frequency (MHz) Site : 03CH07-4Y Condition : PEAK_78.3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 1	Level (dBuV/m) Date: 2020-11-29 Frequency (MHz) Site : 03CH07-4Y Condition : PEAK_78.3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 1

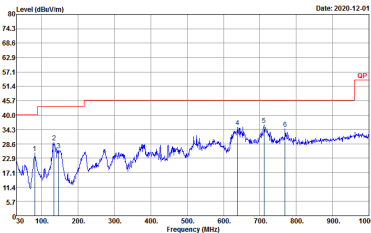
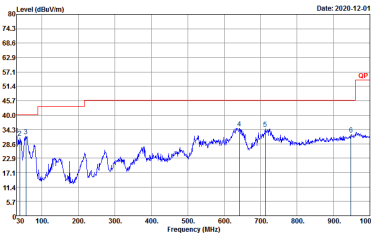


BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2020-11-29 Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 2	Level (dBuV/m) Date: 2020-11-29 Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 2



BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.	Level (dBuV/m) Date: 2020-11-29 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 HORIZONTAL Detector : Peak Project : 862115-01 Mode : 3	Level (dBuV/m) Date: 2020-11-29 Frequency (MHz) Site : 03CH07-01 Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL Detector : Peak Project : 862115-01 Mode : 3

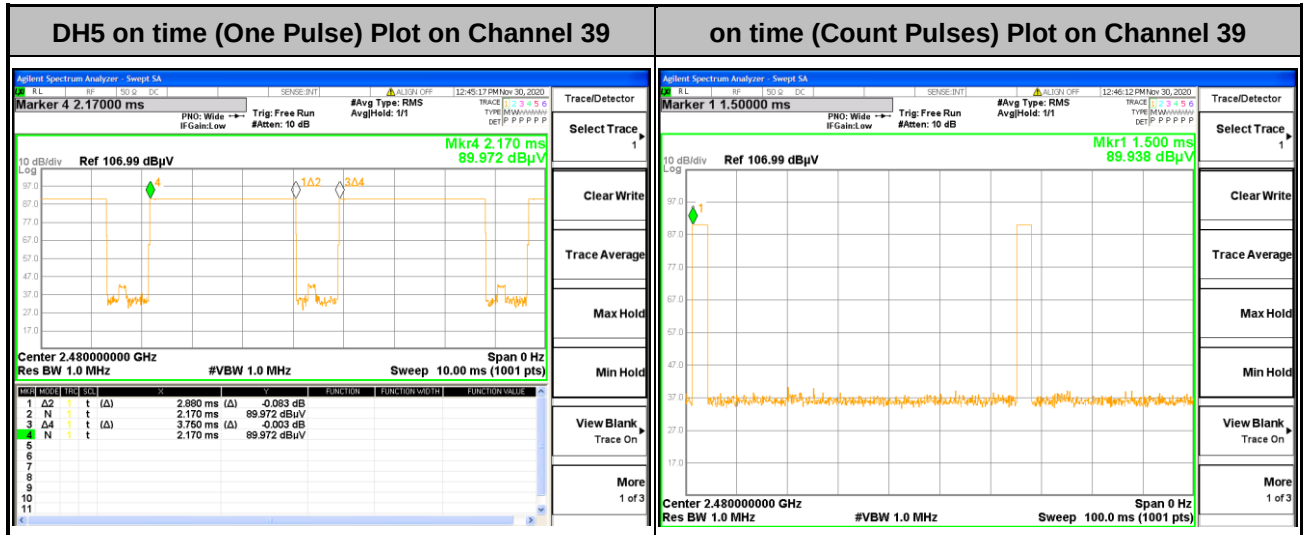
Emission below 1GHz
2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) HORIZONTAL Detector : Peak Project : 862115-01 Mode : 4	 Site : 03CH07-HY Condition : QP 3m LF-ANT-35419(s) VERTICAL Detector : Peak Project : 862115-01 Mode : 4



Appendix E. Duty Cycle Plots

<For SKU 1>



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.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.88 \text{ ms} \times 20 \text{ channels} = 57.6 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.6 \text{ ms}] = 2 \text{ hops}$

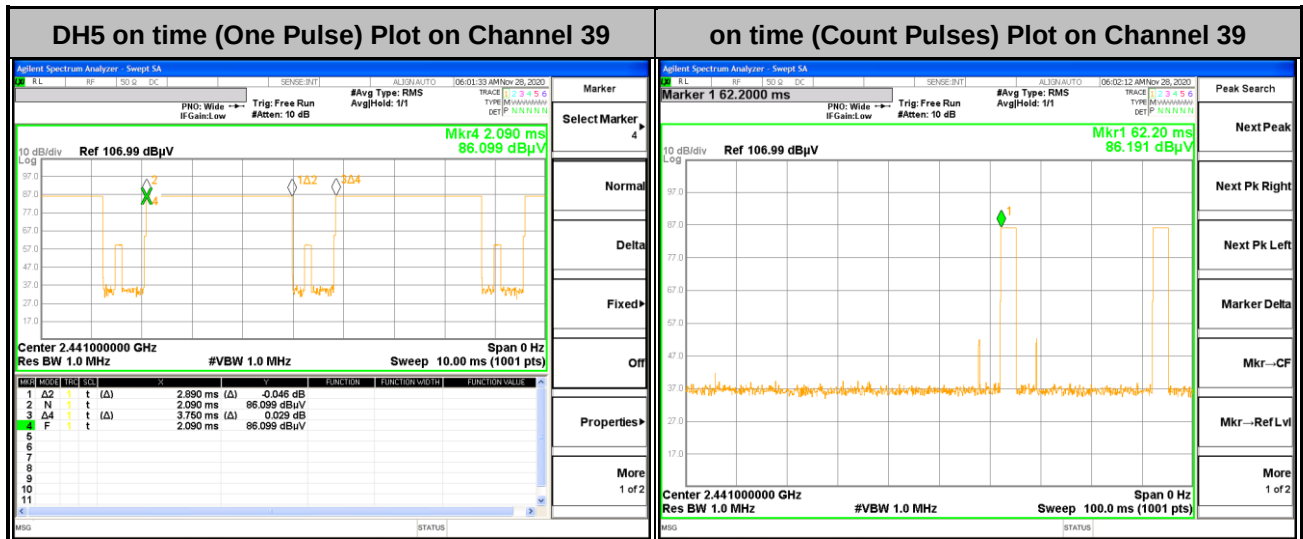
Thus, the maximum possible ON time:

$$2.88 \text{ ms} \times 2 = 5.76 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.76 \text{ ms}/100 \text{ ms}) = -24.79 \text{ dB}$$

<For SKU 2>



Note:

4. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
5. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
6. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.6 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.76 \text{ ms}/100 \text{ ms}) = -24.79 \text{ dB}$$