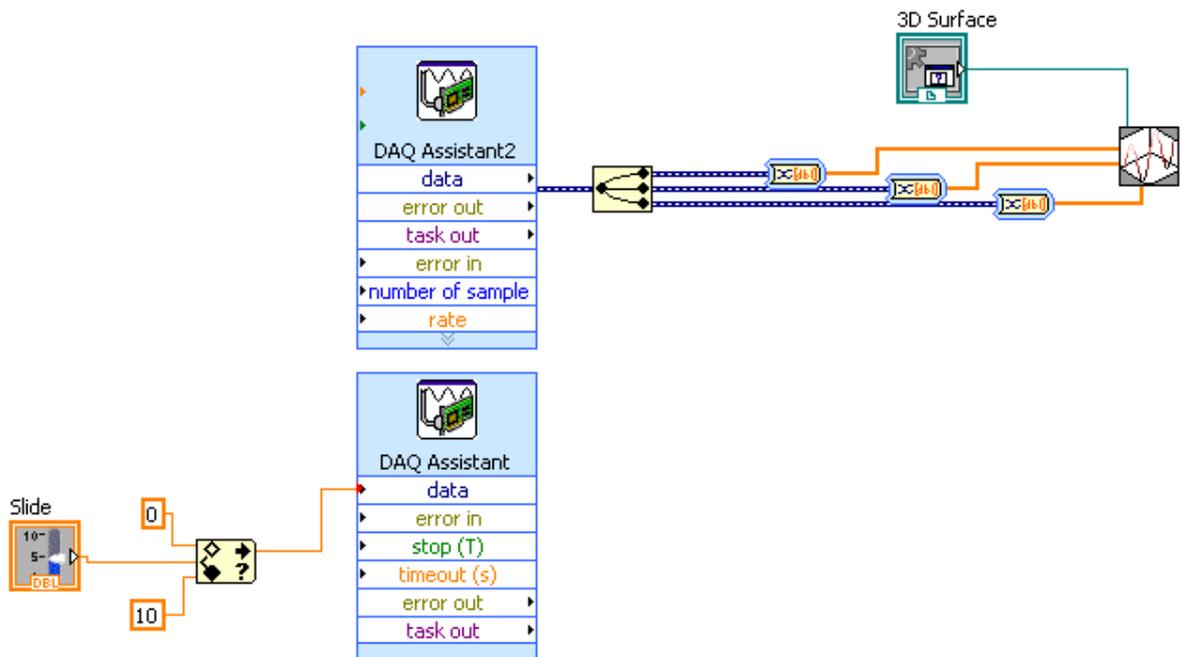


รูปที่ 4. 13 แสดง Block Diagram ในส่วนของกราฟแสดงความอลวล



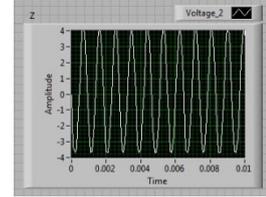
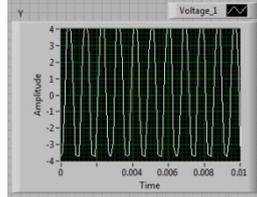
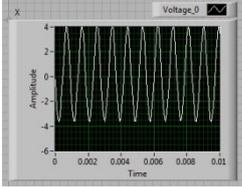
รูปที่ 4. 14 แสดง Block Diagram ในส่วนของการแสดงกราฟแบบสามมิติ

4.4 ผลการทดลอง

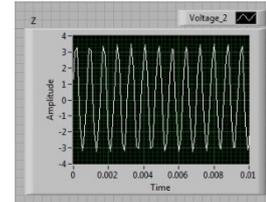
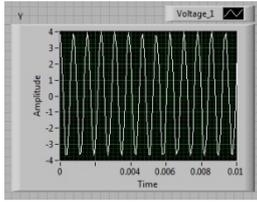
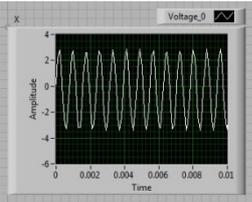
4.4.1 ตอนที่ 1 การหาความเป็นคออส

ผลการทดลองที่ได้จากวงจรสมการที่ 4.1 ($\ddot{x} = -0.5\dot{x} - x + \text{sgn}(x)$)

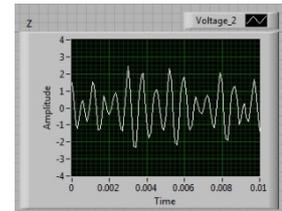
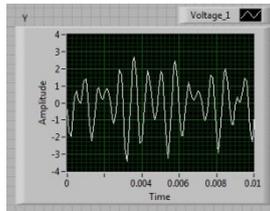
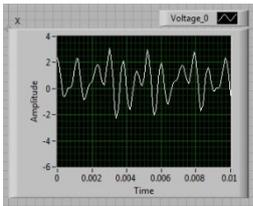
$a = 0$ V



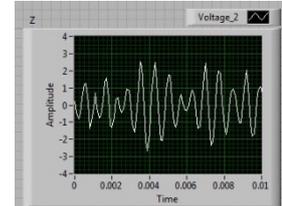
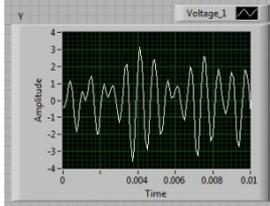
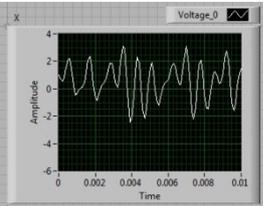
$a = 3.26531$ V



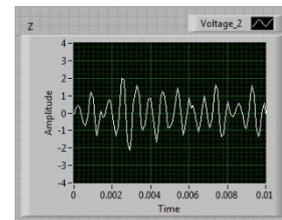
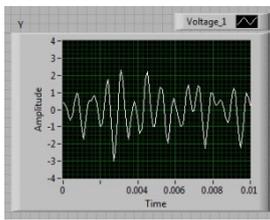
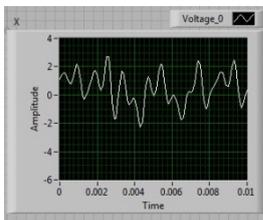
$a = 3.31633$ V



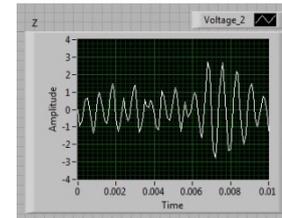
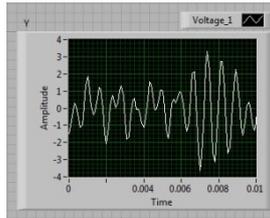
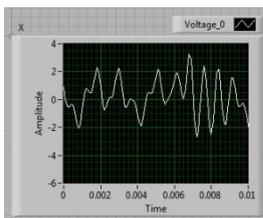
$a = 4.13215$ V

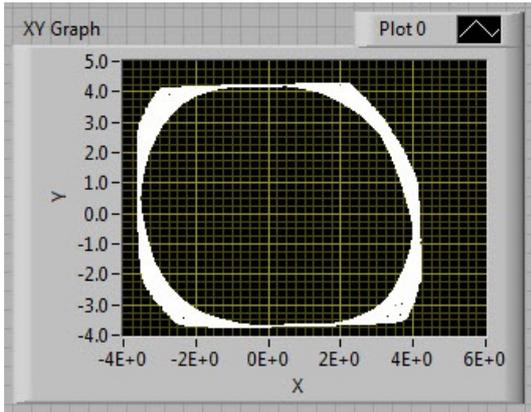


$a = 4.59184$ V

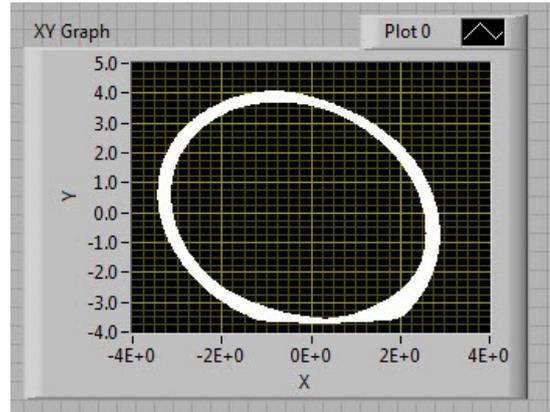


$a = 5$ V

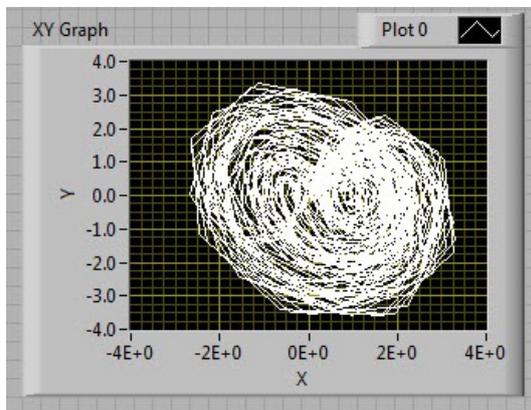




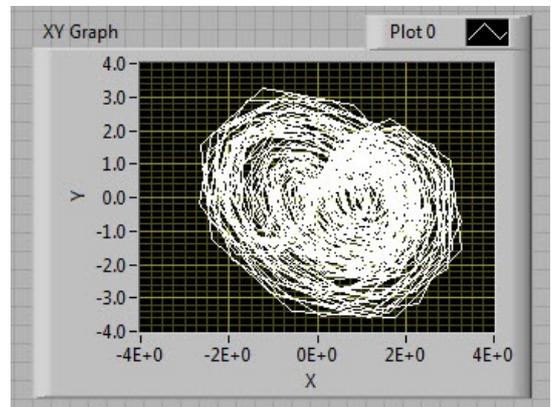
$a = 0 \text{ V}$



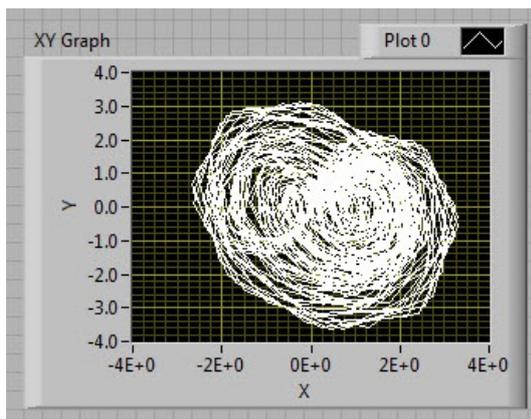
$a = 3.26531 \text{ V}$



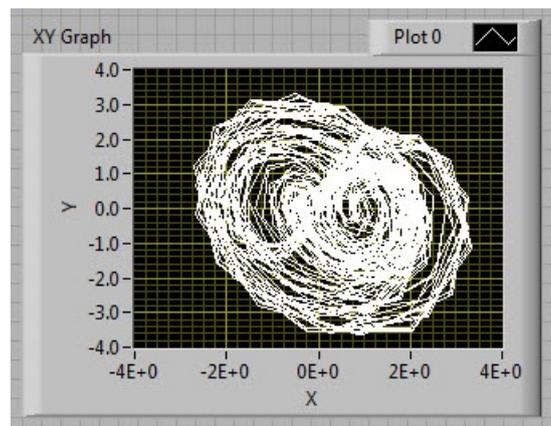
$a = 3.31633 \text{ V}$



$a = 4.13265 \text{ V}$

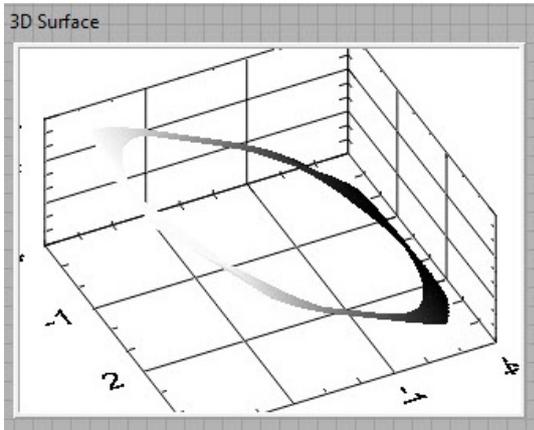


$a = 4.59184 \text{ V}$

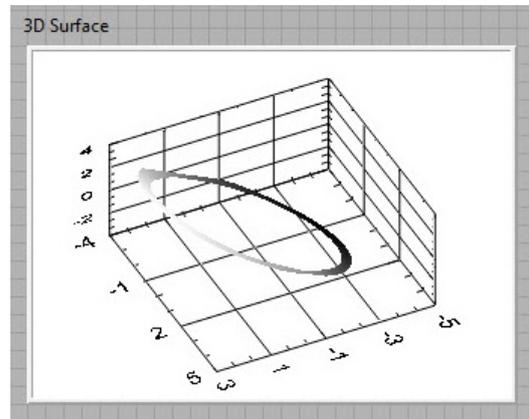


$a = 5 \text{ V}$

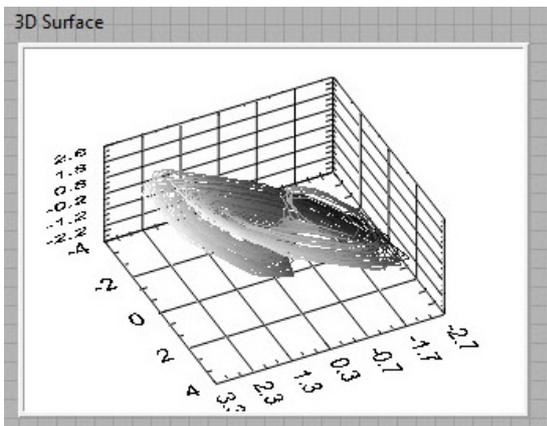
รูปที่ 4.17 แสดงผลการทดลองปรับค่า A ในช่วง $0 - 5 \text{ V}$ ในรูปกราฟแสดงความอลวน



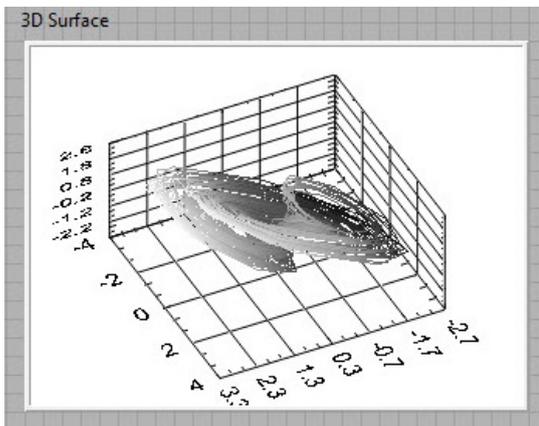
$a = 0 \text{ V}$



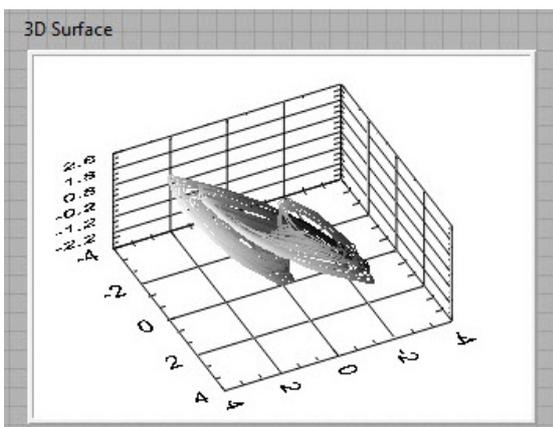
$a = 3.26531 \text{ V}$



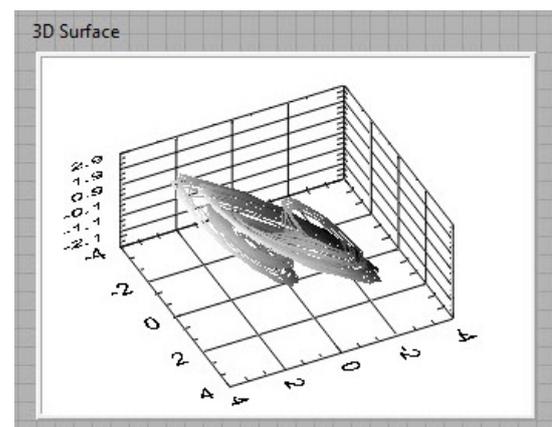
$a = 3.31633 \text{ V}$



$a = 4.13265 \text{ V}$

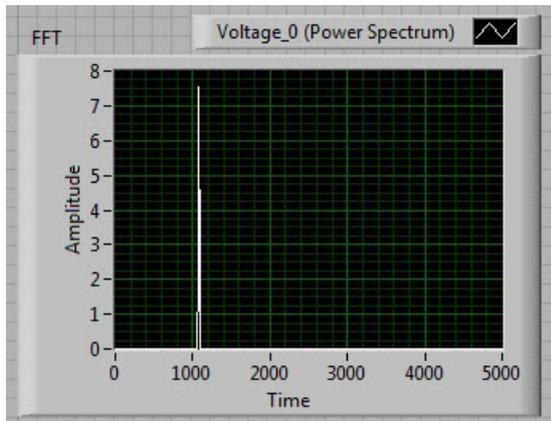


$a = 4.59184 \text{ V}$

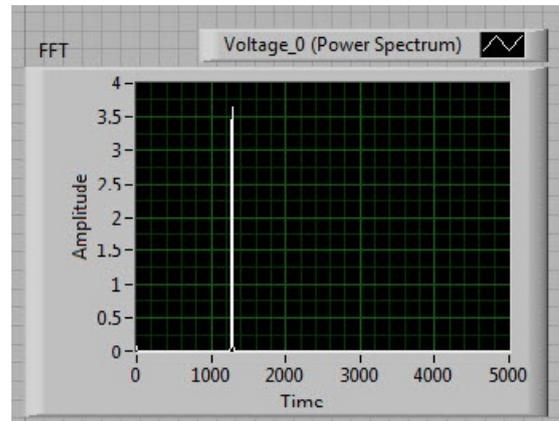


$a = 5 \text{ V}$

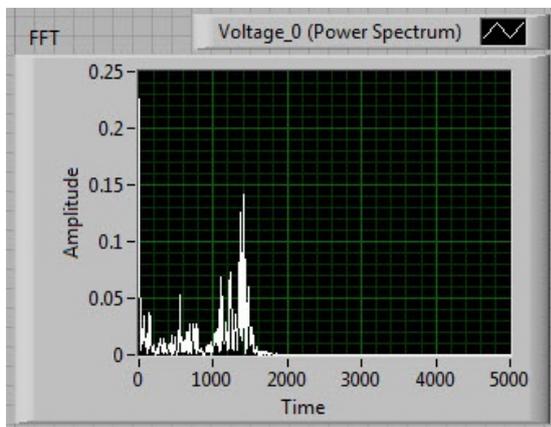
รูปที่ 4.18 แสดงผลการทดลองปรับค่า A ในช่วง $0 - 5 \text{ V}$ ในรูปกราฟสามมิติ



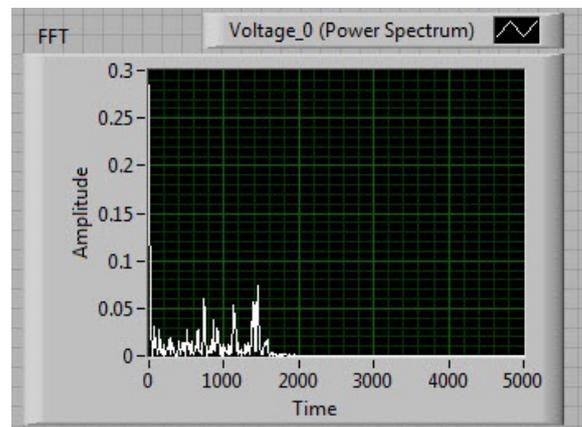
a = 0 V



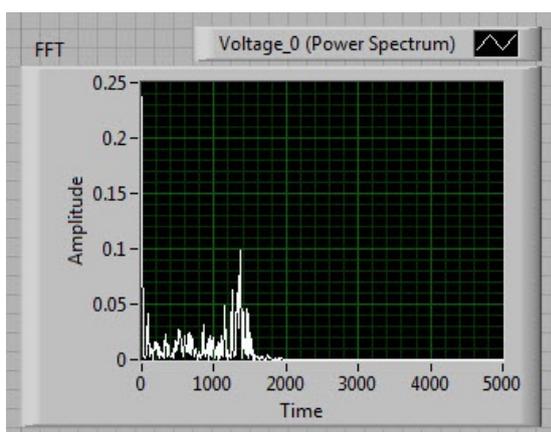
a = 3.26531 V



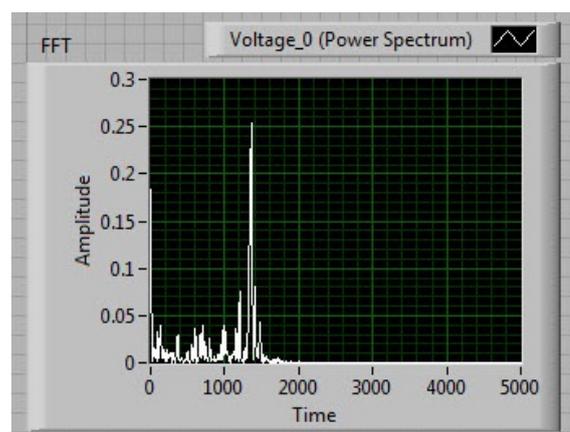
a = 3.31633 V



a = 4.13265 V

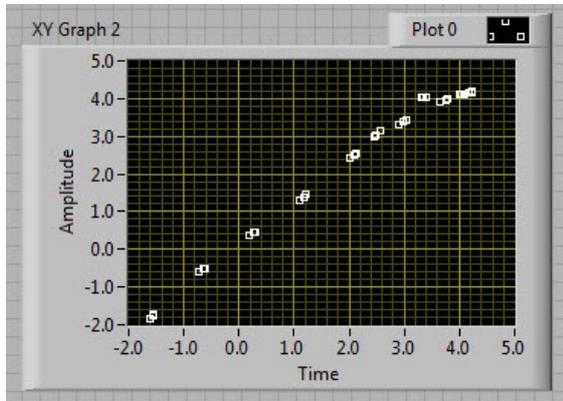
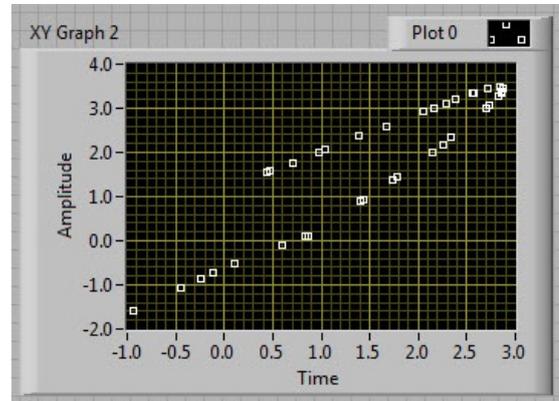
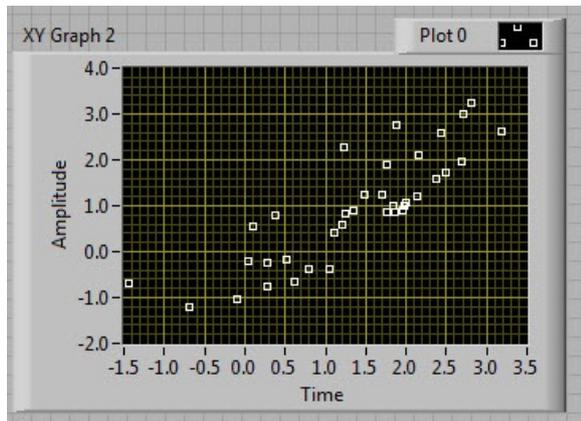
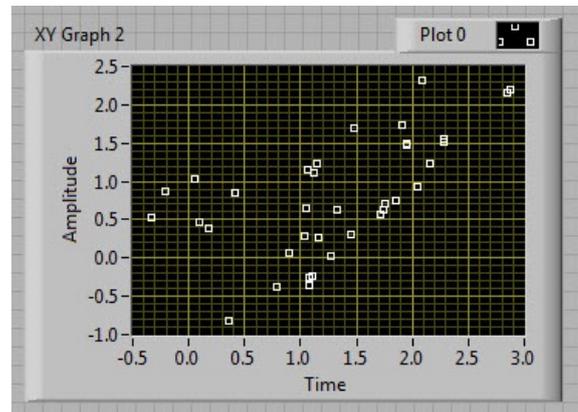
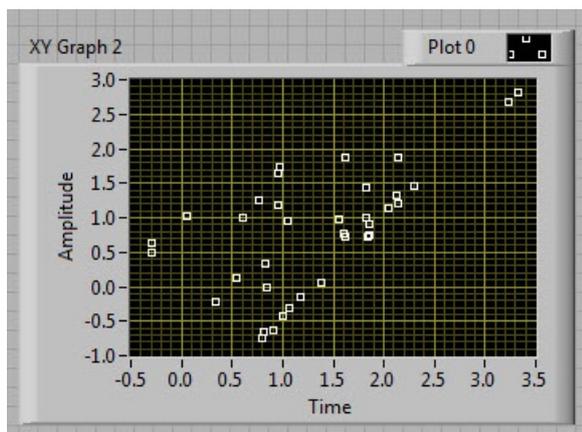
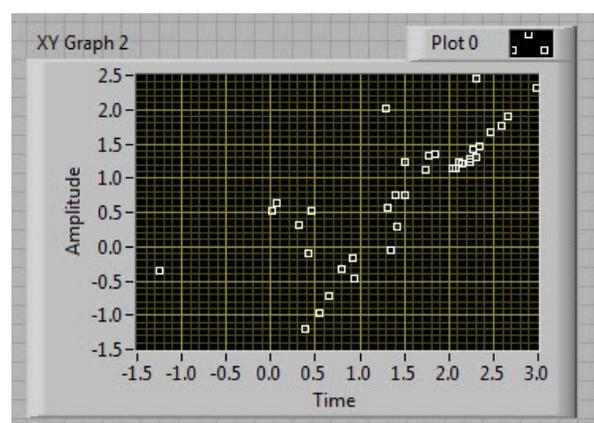


a = 4.59184 V



a = 5 V

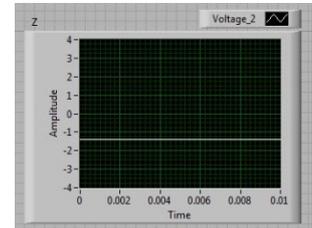
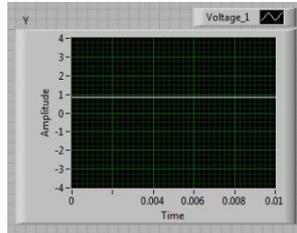
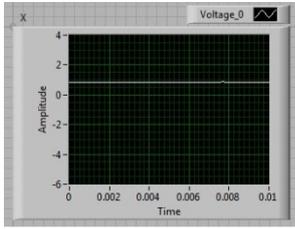
รูปที่ 4.19 แสดงค่า Frequency spectra (FFT) จากการทดลองปรับค่า A ในช่วง 0 – 5 V


 $a = 0 \text{ V}$

 $a = 3.26531 \text{ V}$

 $a = 3.31633 \text{ V}$

 $a = 4.13265 \text{ V}$

 $a = 4.59184 \text{ V}$

 $a = 5 \text{ V}$

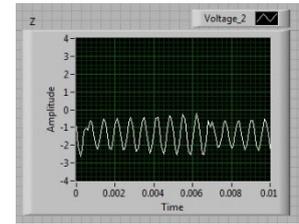
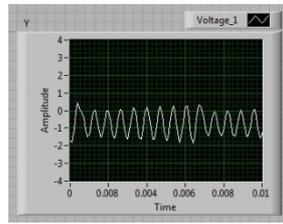
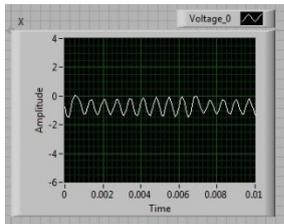
รูปที่ 4.20 แสดงค่า Poincare's map จากการทดลองปรับค่า A ในช่วง $0 - 5 \text{ V}$

ผลการทดลองที่ได้จากวงจรที่ 3 (จากสมการที่ 3 : $\ddot{x} = -0.7\ddot{x} - \dot{x} - x + H(x)$)

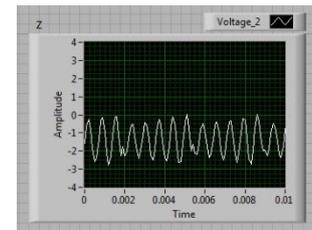
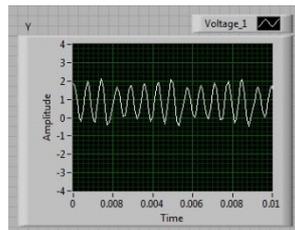
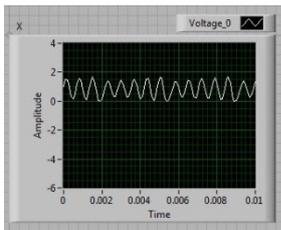
$C > 2$ V



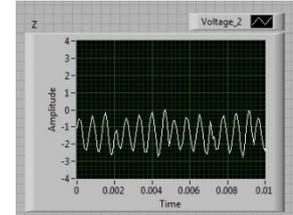
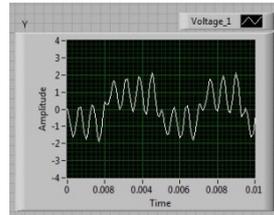
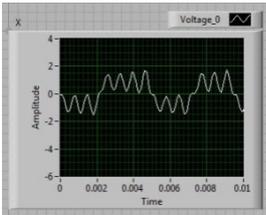
$C = 1.68367$ V



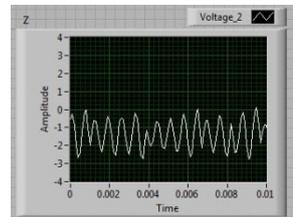
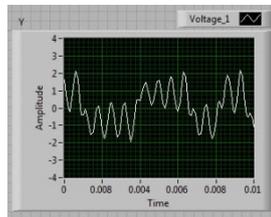
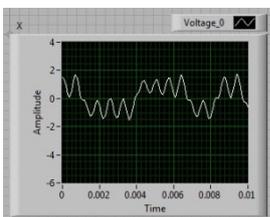
$C = 1.53061$ V



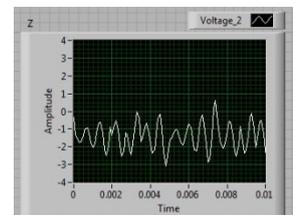
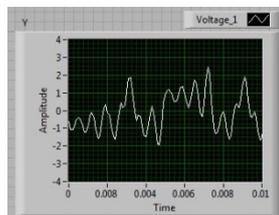
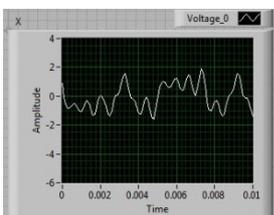
$C = 1.37755$ V

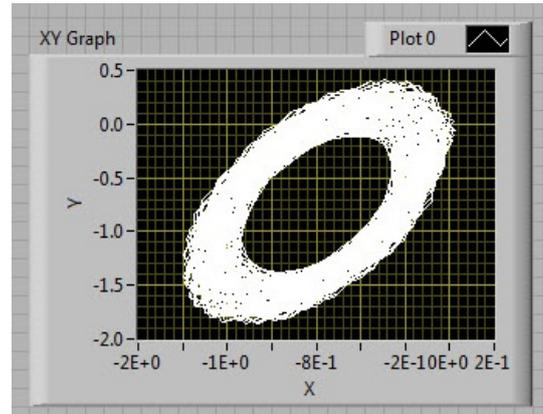
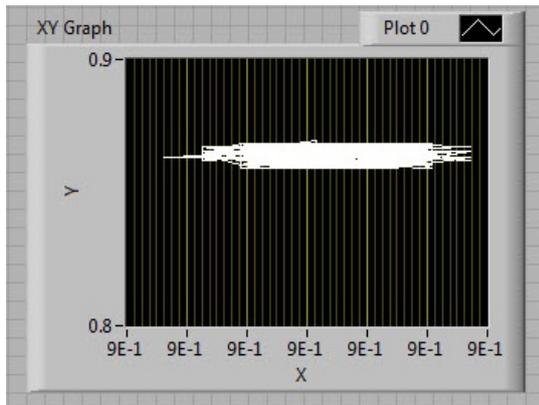


$C = 1.12245$ V

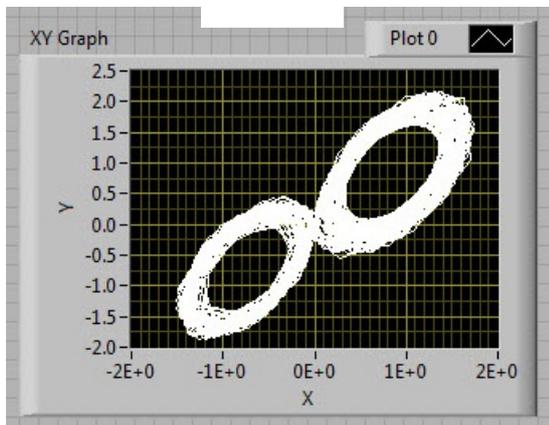


$C = 0$ V

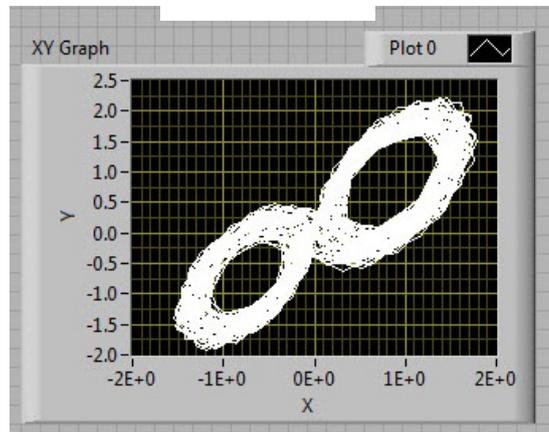




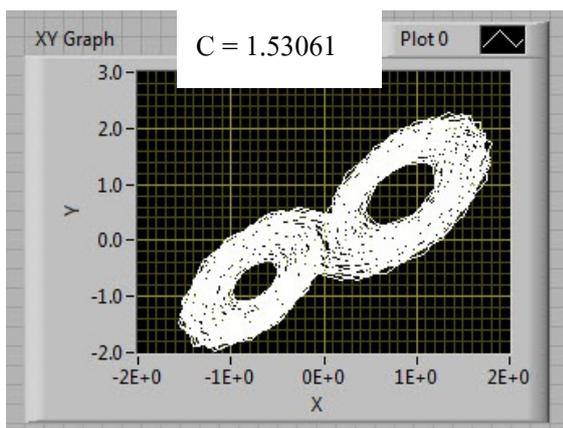
$C > 2 \text{ V}$



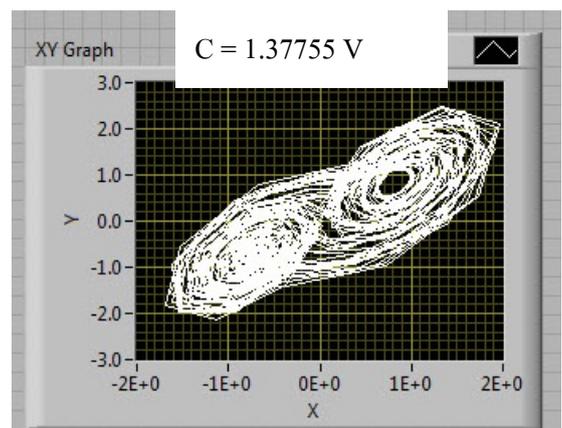
$C = 1.68367 \text{ V}$



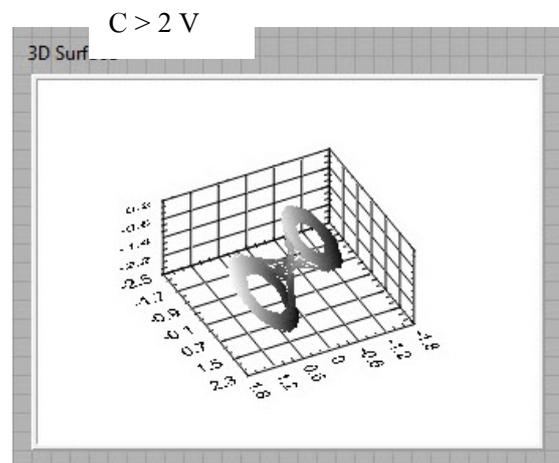
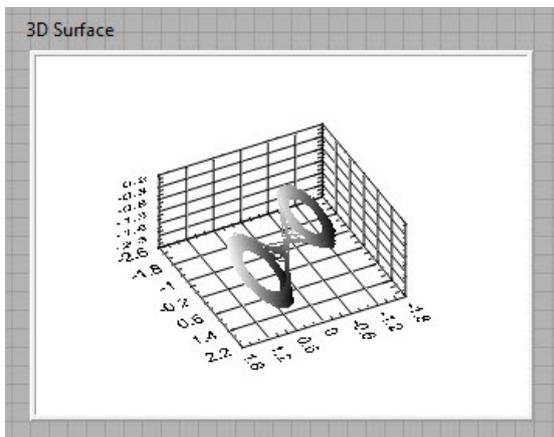
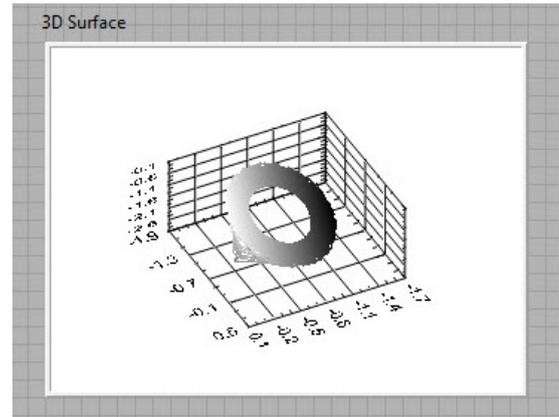
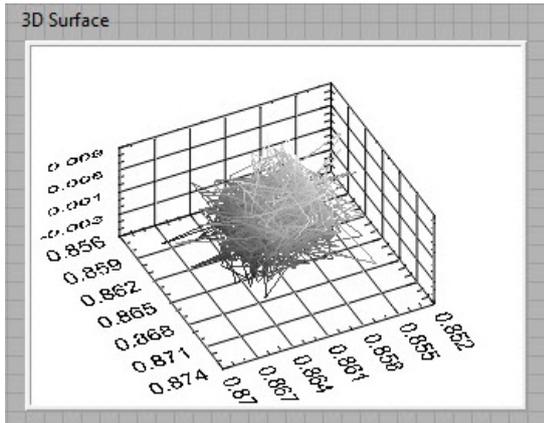
$C = 1.53061$



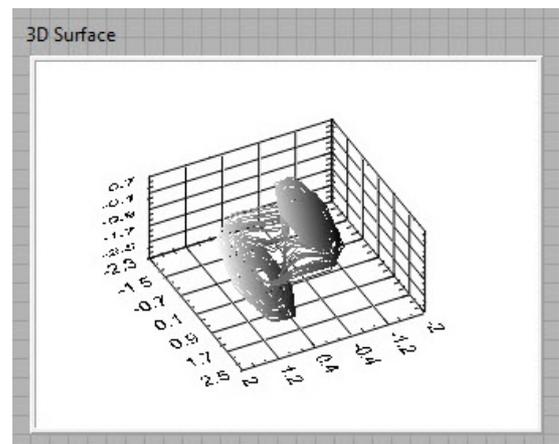
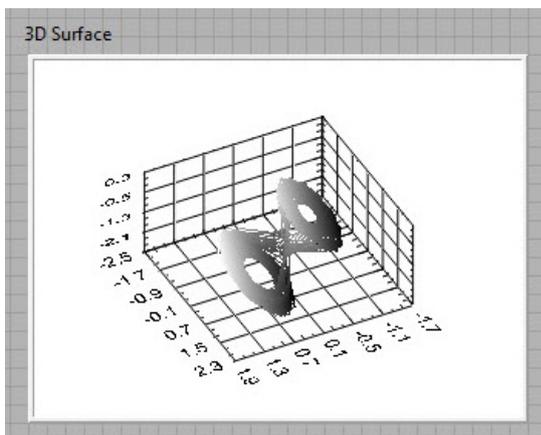
$C = 1.37755 \text{ V}$



รูปที่ 4.21 แสดงผลการทดลองปรับค่า C ในช่วง $0 - 5 \text{ V}$ ในรูปกราฟแสดงความอลวน

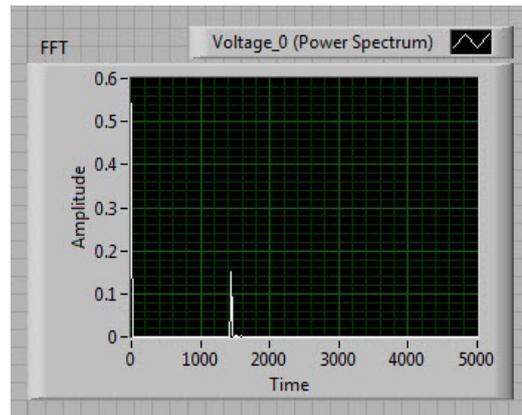
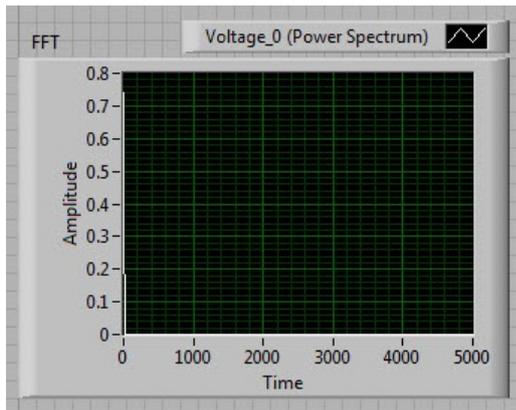


$$C = 1.37755 V$$

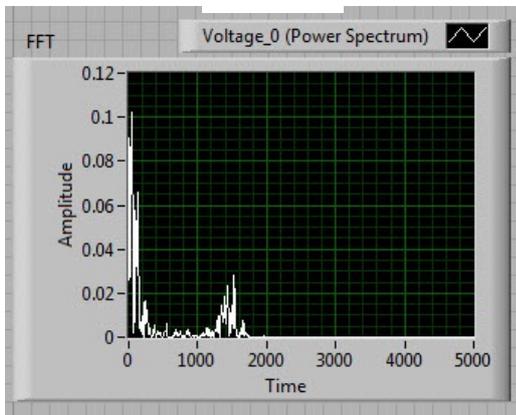


$$C = 0 V$$

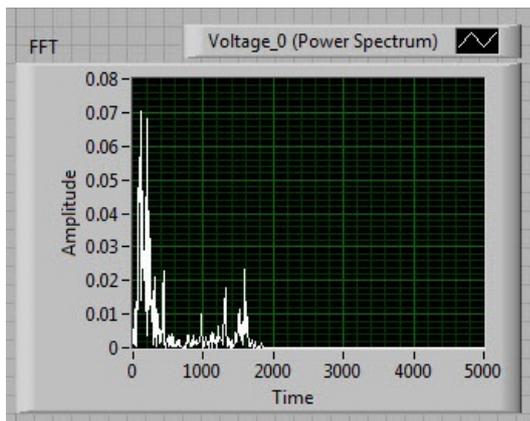
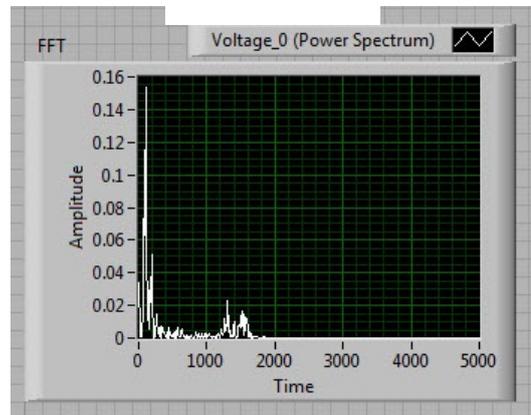
รูปที่ 4.22 แสดงผลการทดลองปรับค่า C ในช่วง $0 - 5 V$ ในรูปกราฟสามมิติ



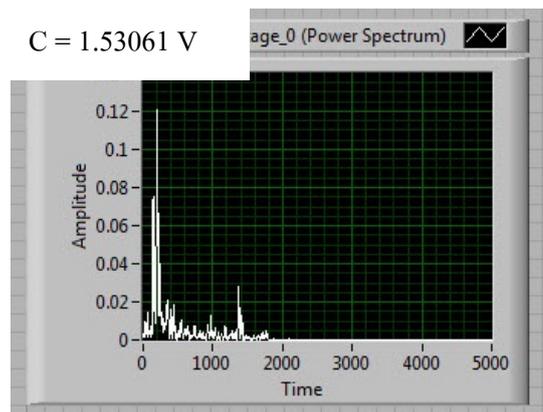
$C > 2 \text{ V}$



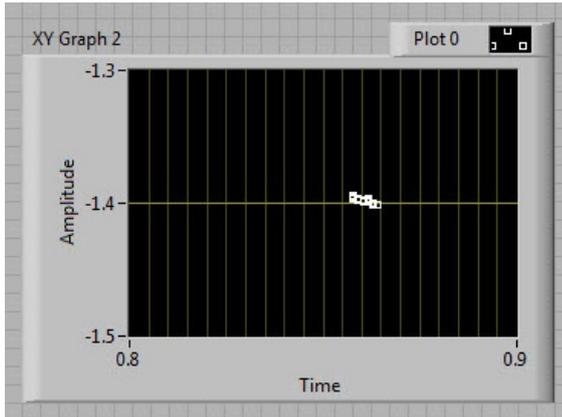
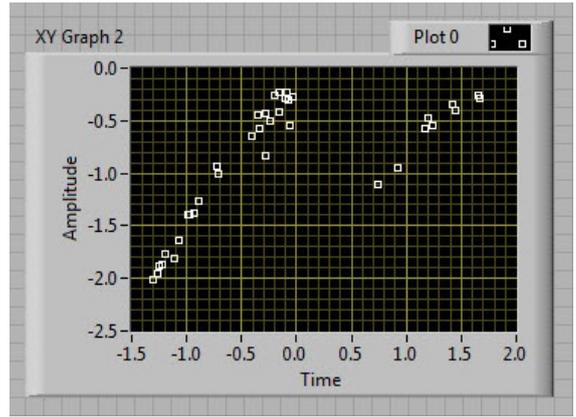
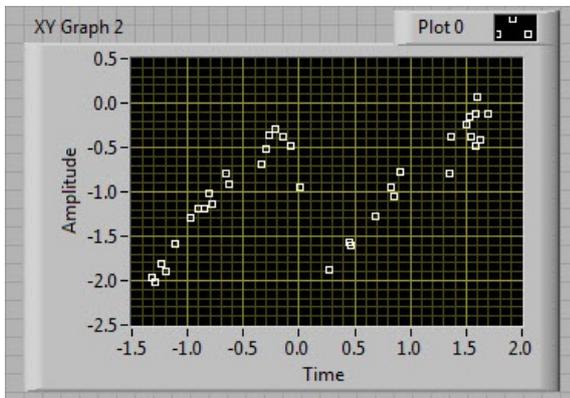
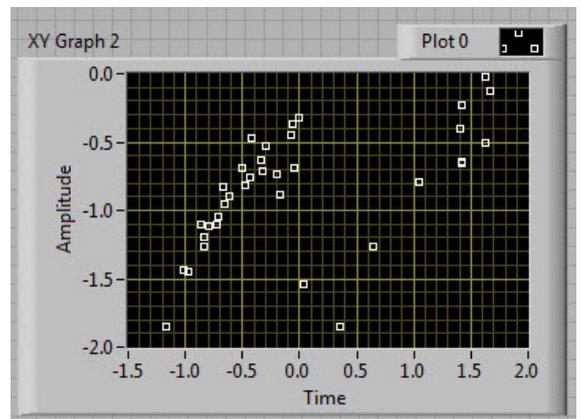
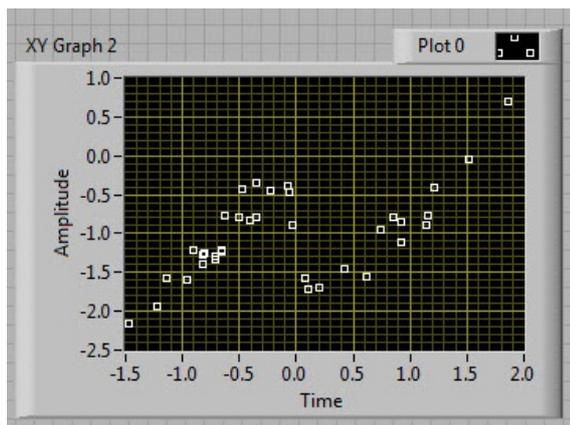
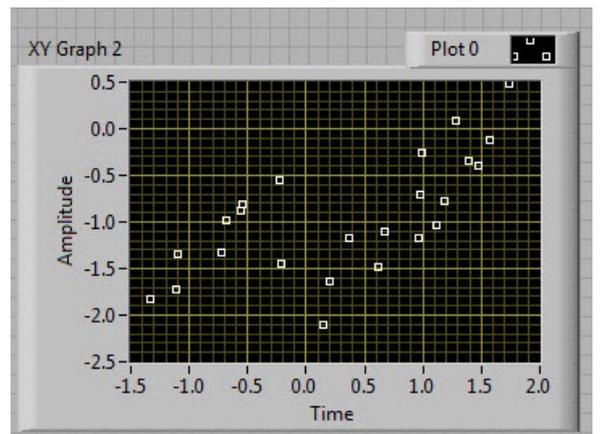
$C = 1.68367 \text{ V}$



$C = 1.53061 \text{ V}$

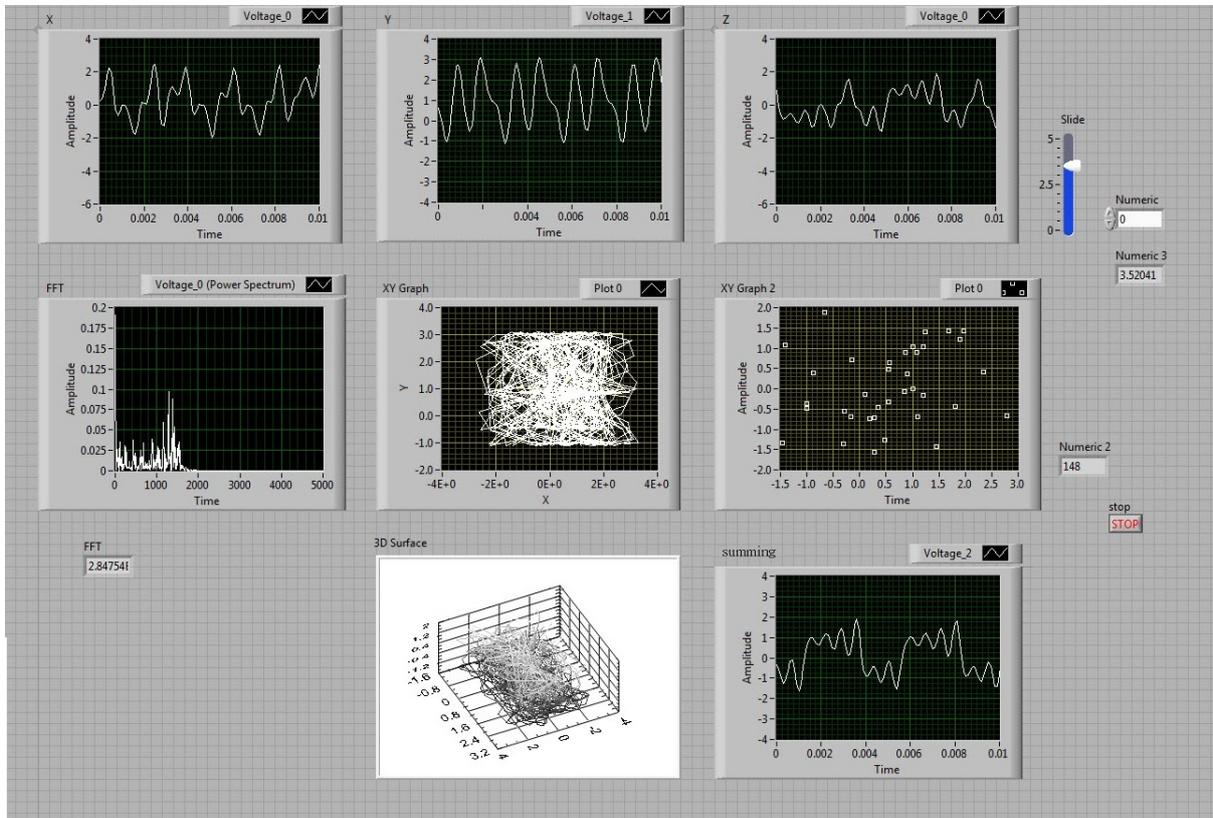


รูปที่ 4.23 แสดงค่า Frequency spectra (FFT) จากการทดลองปรับค่า C ในช่วง $0 - 5 \text{ V}$

 $C > 2 \text{ V}$  $C = 1.68367 \text{ V}$  $C = 1.53061 \text{ V}$  $C = 1.37755 \text{ V}$  $C = 1.12245 \text{ V}$  $C = 0 \text{ V}$

รูปที่ 4.24 แสดงค่า Poincaré's map จากการทดลองปรับค่า C ในช่วง $0 - 5 \text{ V}$

4.2.2 ตอนที่ 2 การสร้างสัญญาณจำลองคลื่นสมอง



รูปที่ 4.23 แสดงค่า ผลการทดลองที่ได้จาก โปรแกรม LabVIEW