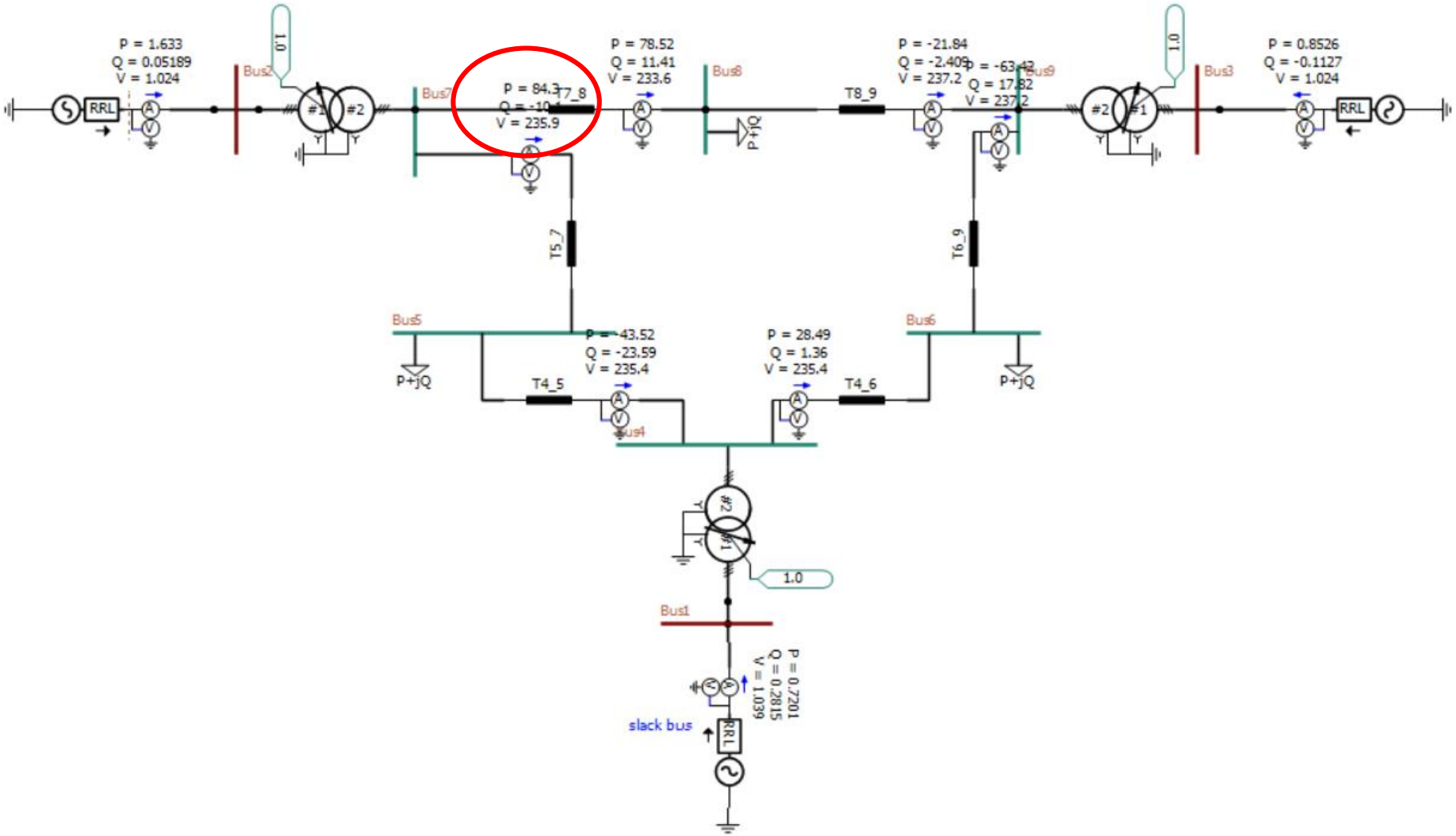
Fault Study

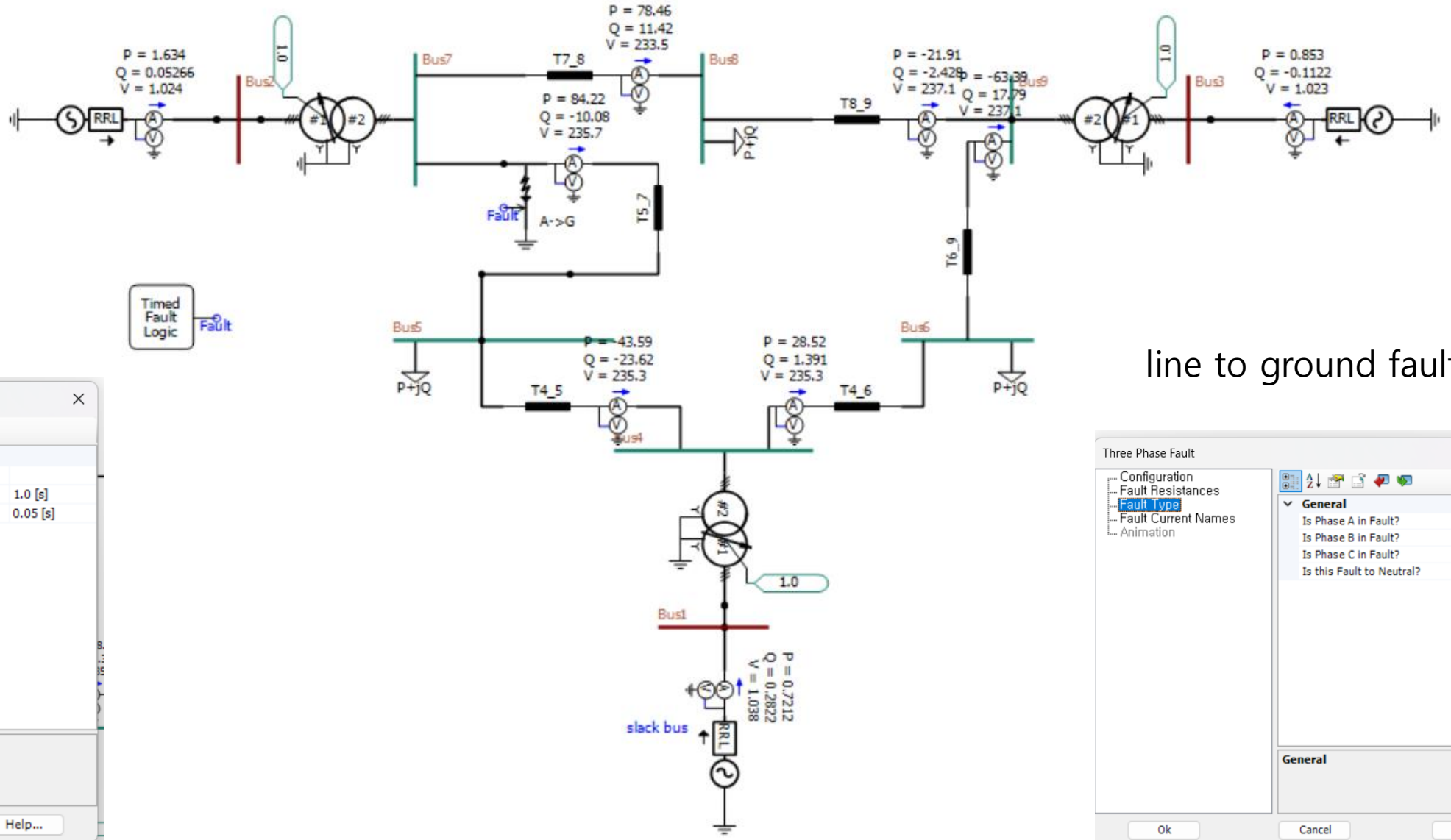
- IEEE 9 Bus Fault Tutorial Practice
  - How to do fault analysis in PSCAD
    - With and without line tripping
  - Base case analysis

- IEEE 14 Bus Fault Simulations
  - GFM:GFL 비율에 따른 시뮬레이션
  - GFL 사이에 Fault 시뮬레이션
  - With ACG 시뮬레이션

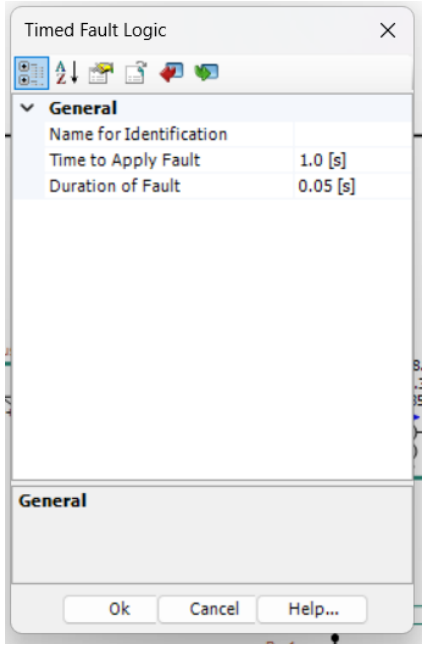
IEEE 9 Bus Power Flows



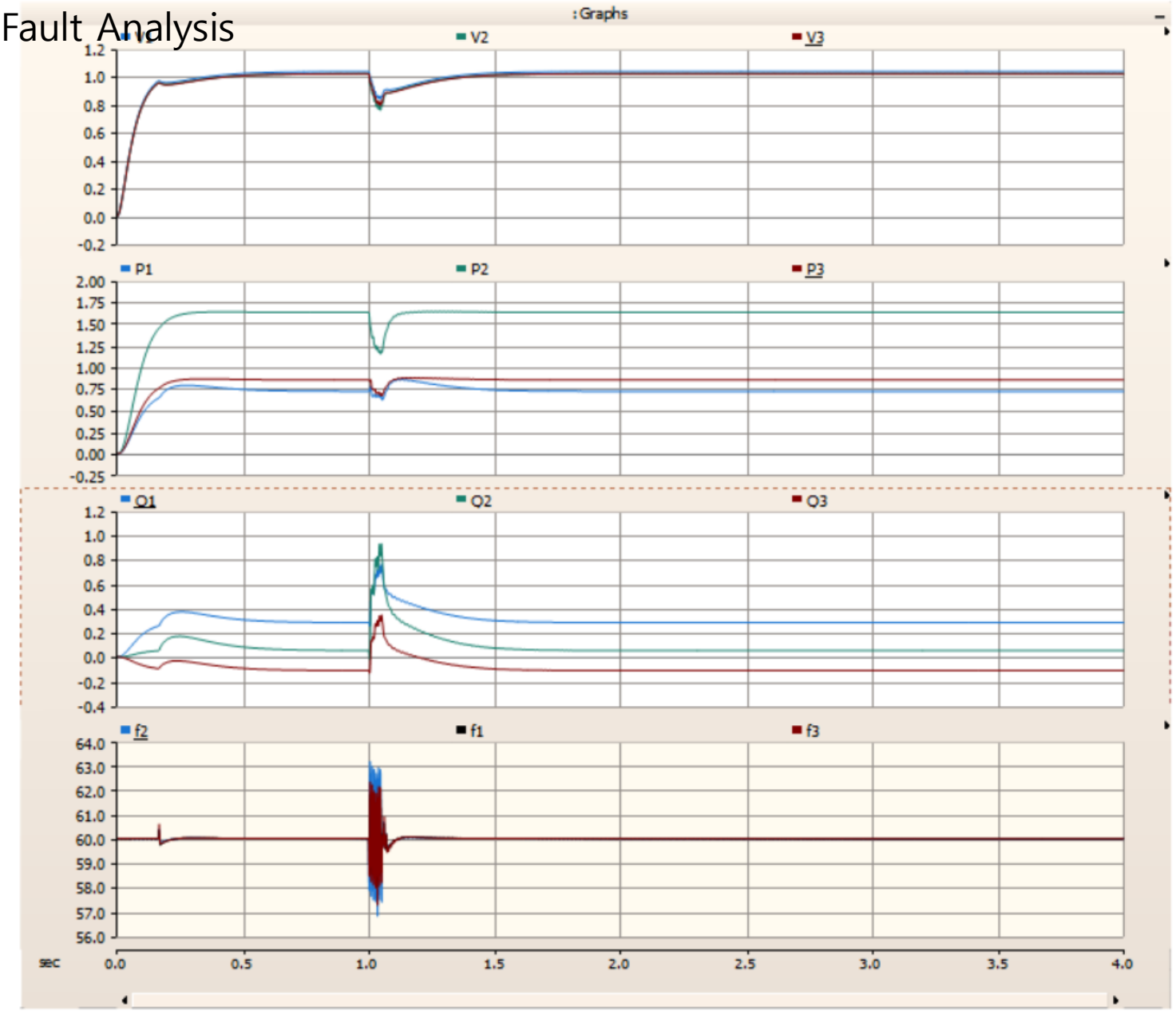
IEEE 9 Bus Simple Fault Analysis



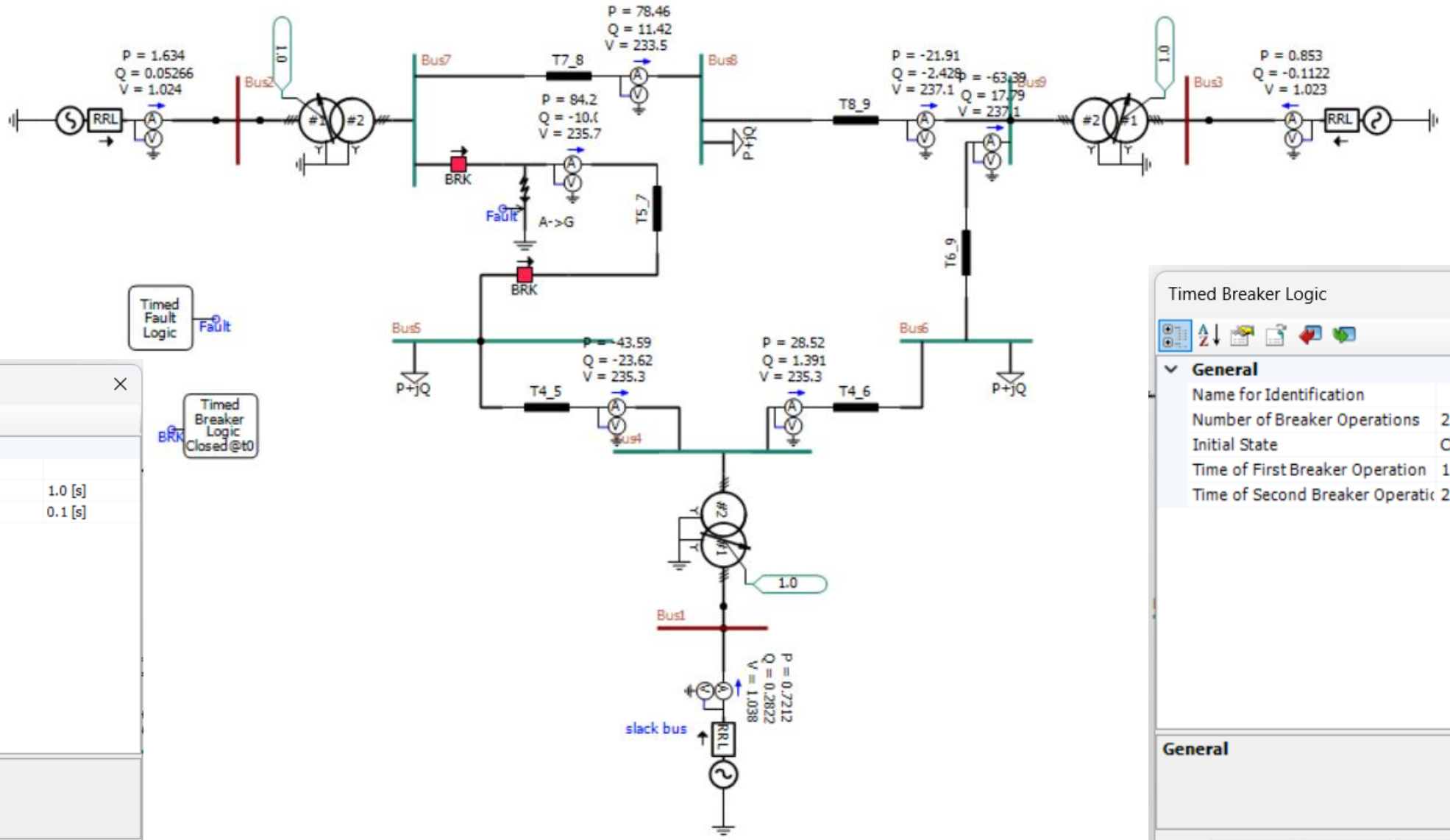
line to ground fault



IEEE 9 Bus Simple Fault Analysis



IEEE 9 Bus Simple Fault Analysis + Breaker



Timed Fault Logic

General	
Name for Identification	
Time to Apply Fault	1.0 [s]
Duration of Fault	0.1 [s]

General

Ok Cancel Help...

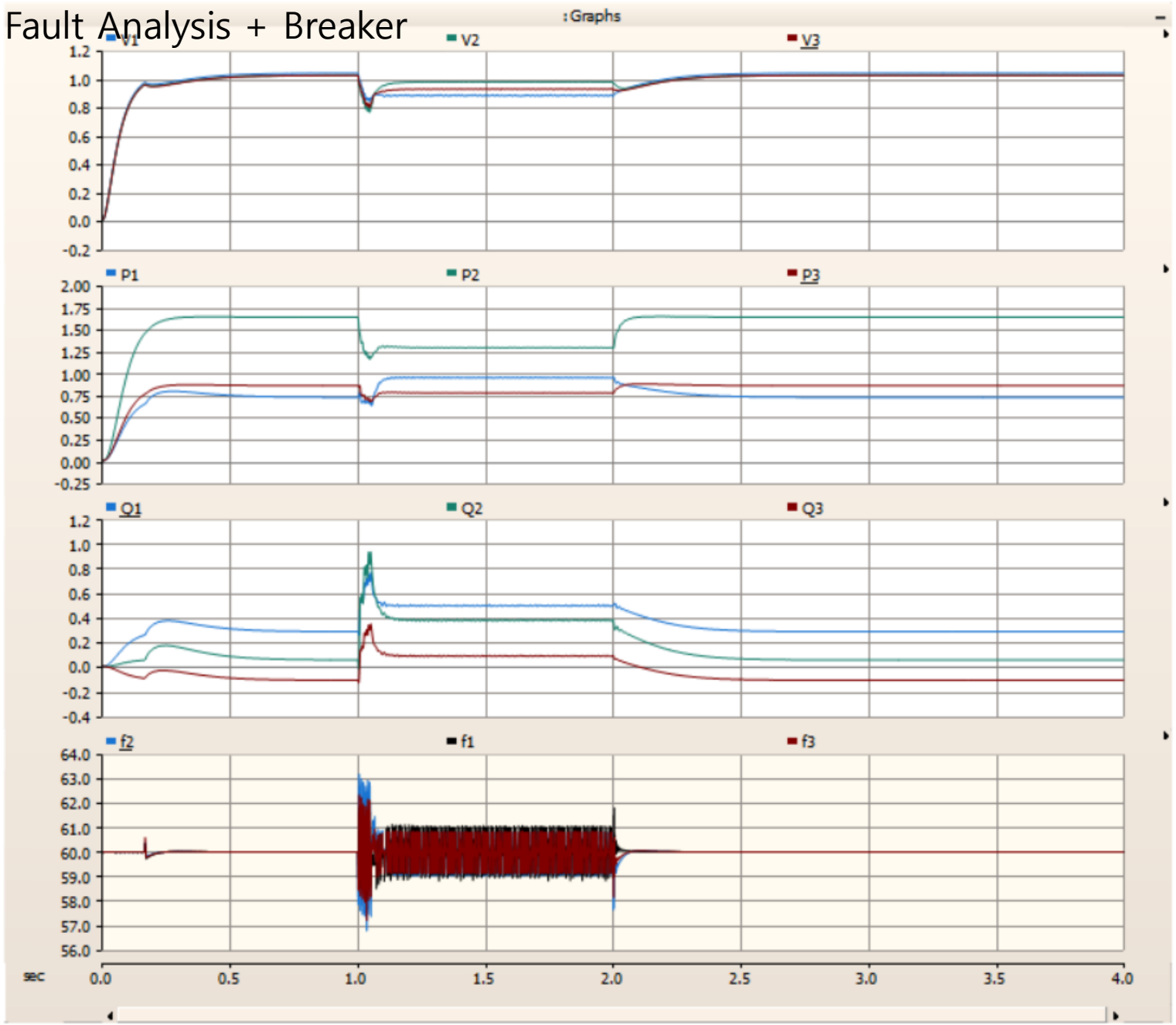
Timed Breaker Logic

General	
Name for Identification	
Number of Breaker Operations	2
Initial State	Close
Time of First Breaker Operation	1.05 [s]
Time of Second Breaker Operati	2 [s]

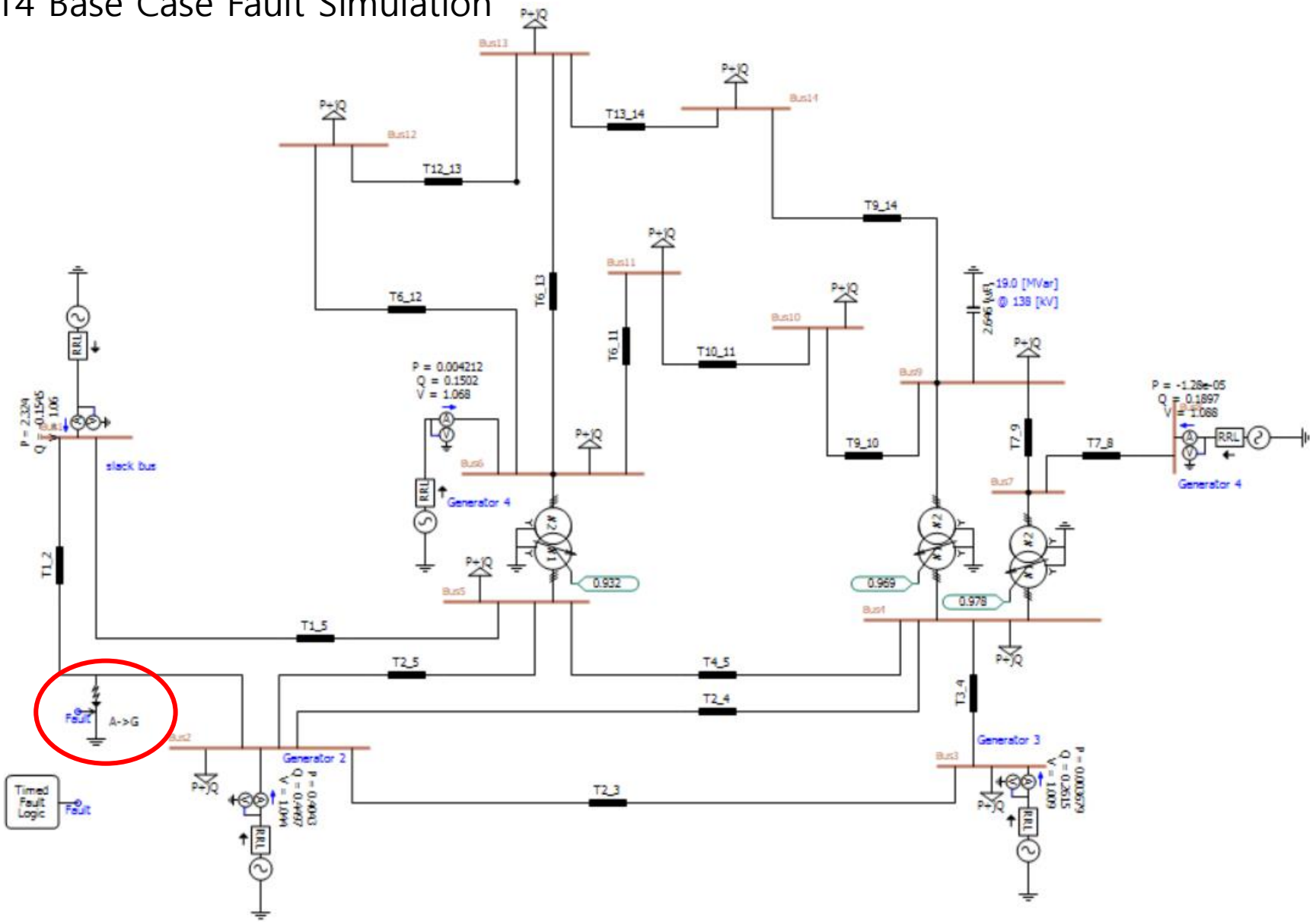
General

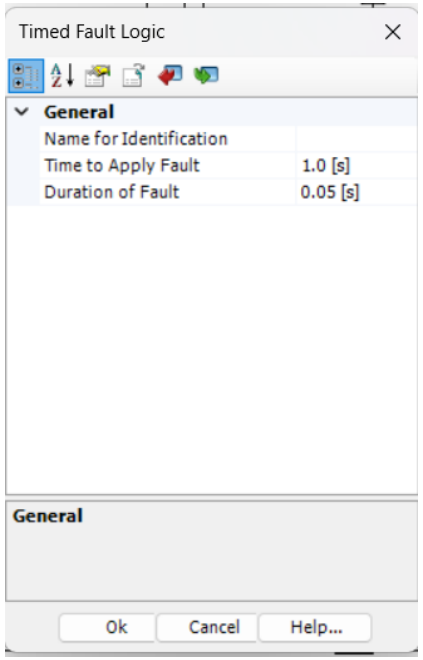
Ok Cancel Help...

IEEE 9 Bus Simple Fault Analysis + Breaker

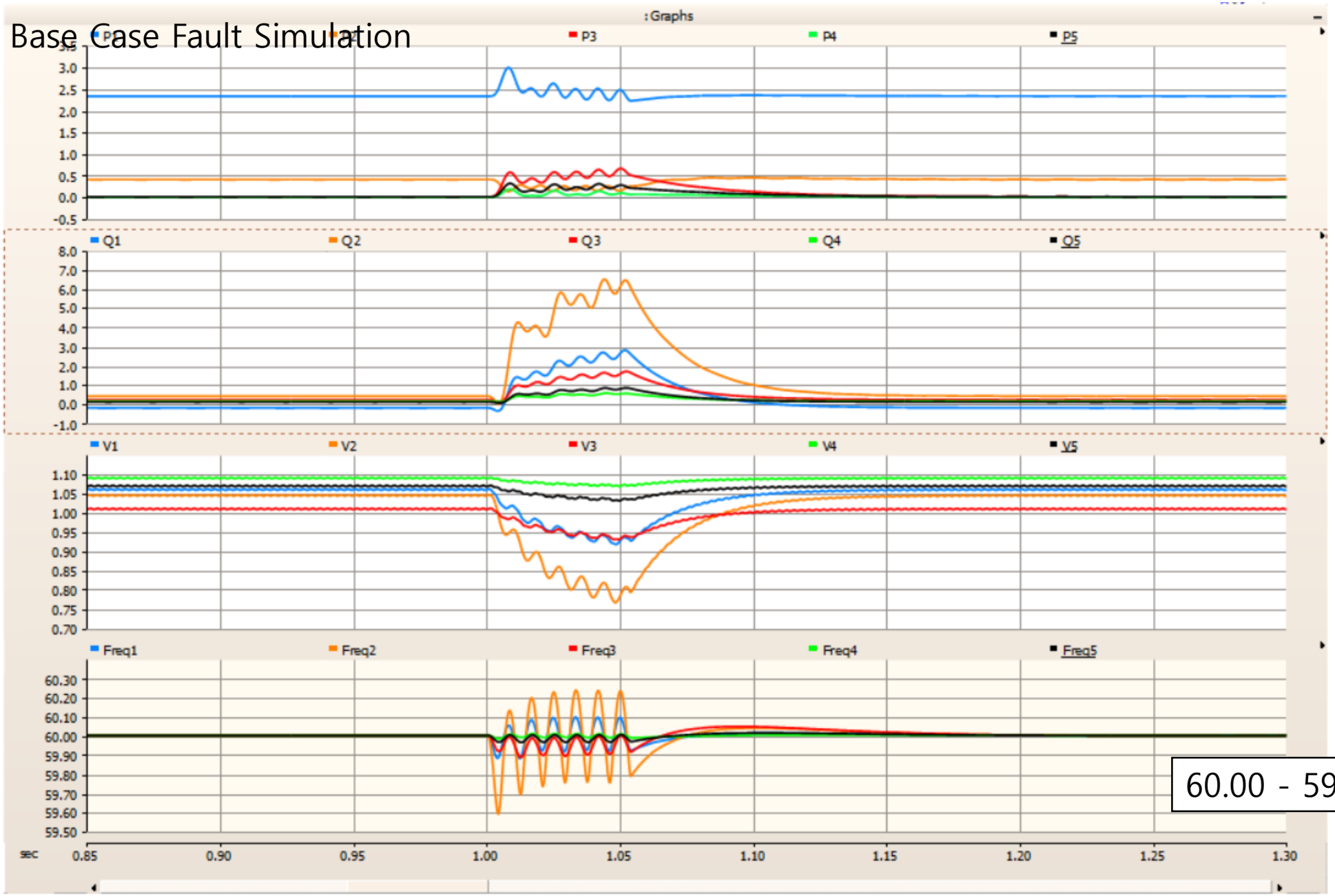


IEEE 14 Base Case Fault Simulation



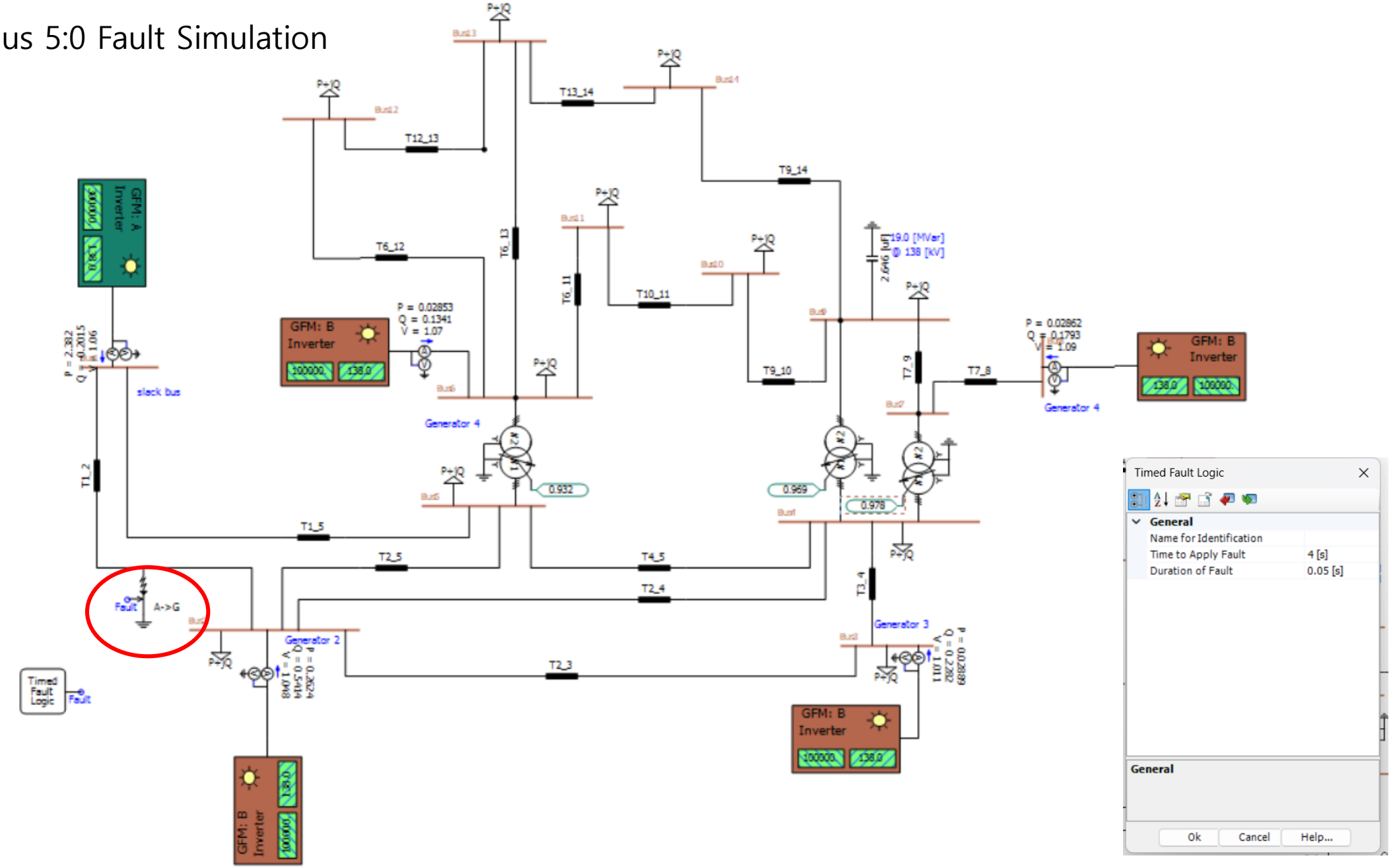


IEEE 14 Base Case Fault Simulation

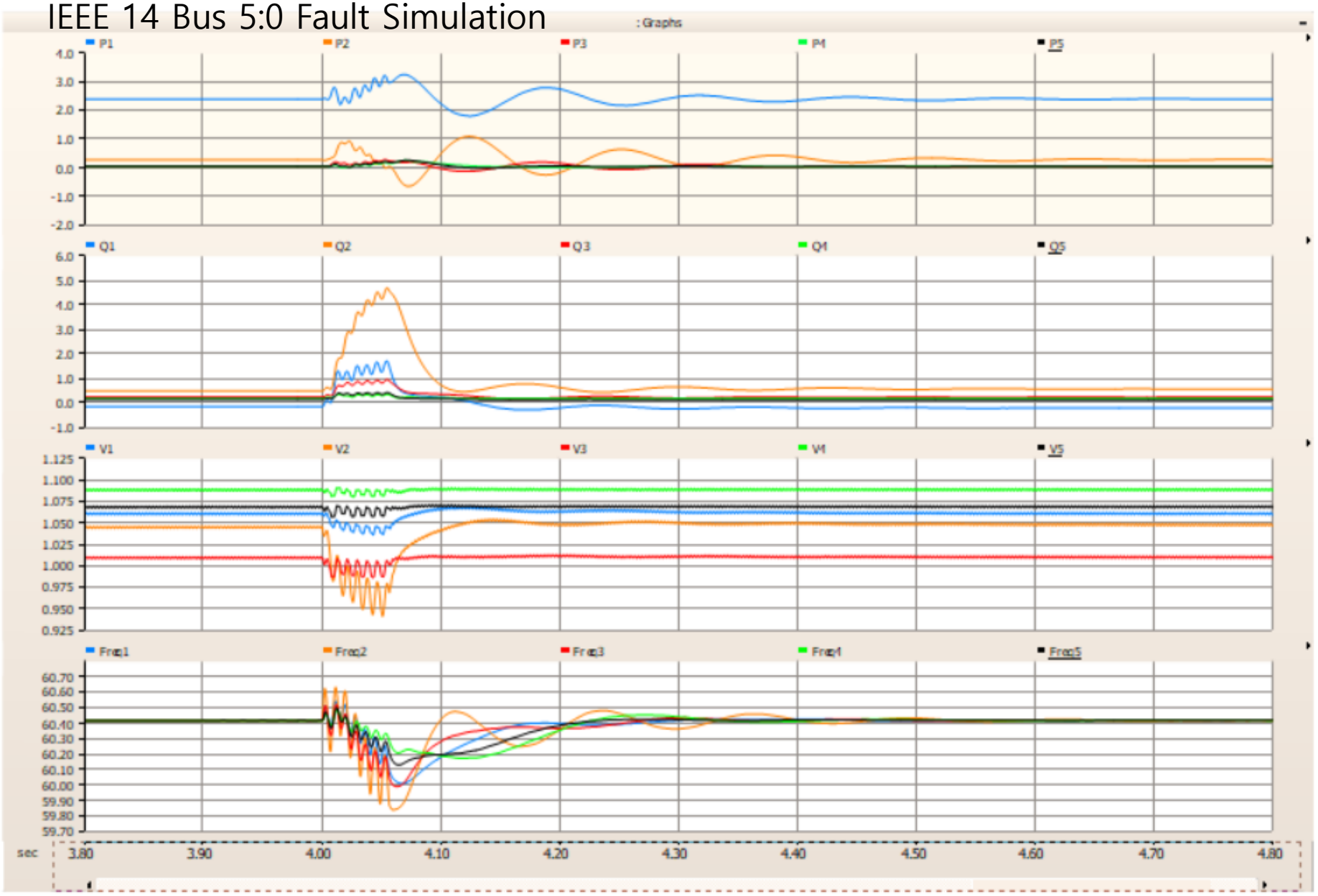


60.00 - 59.6 =0.4

IEEE 14 Bus 5:0 Fault Simulation

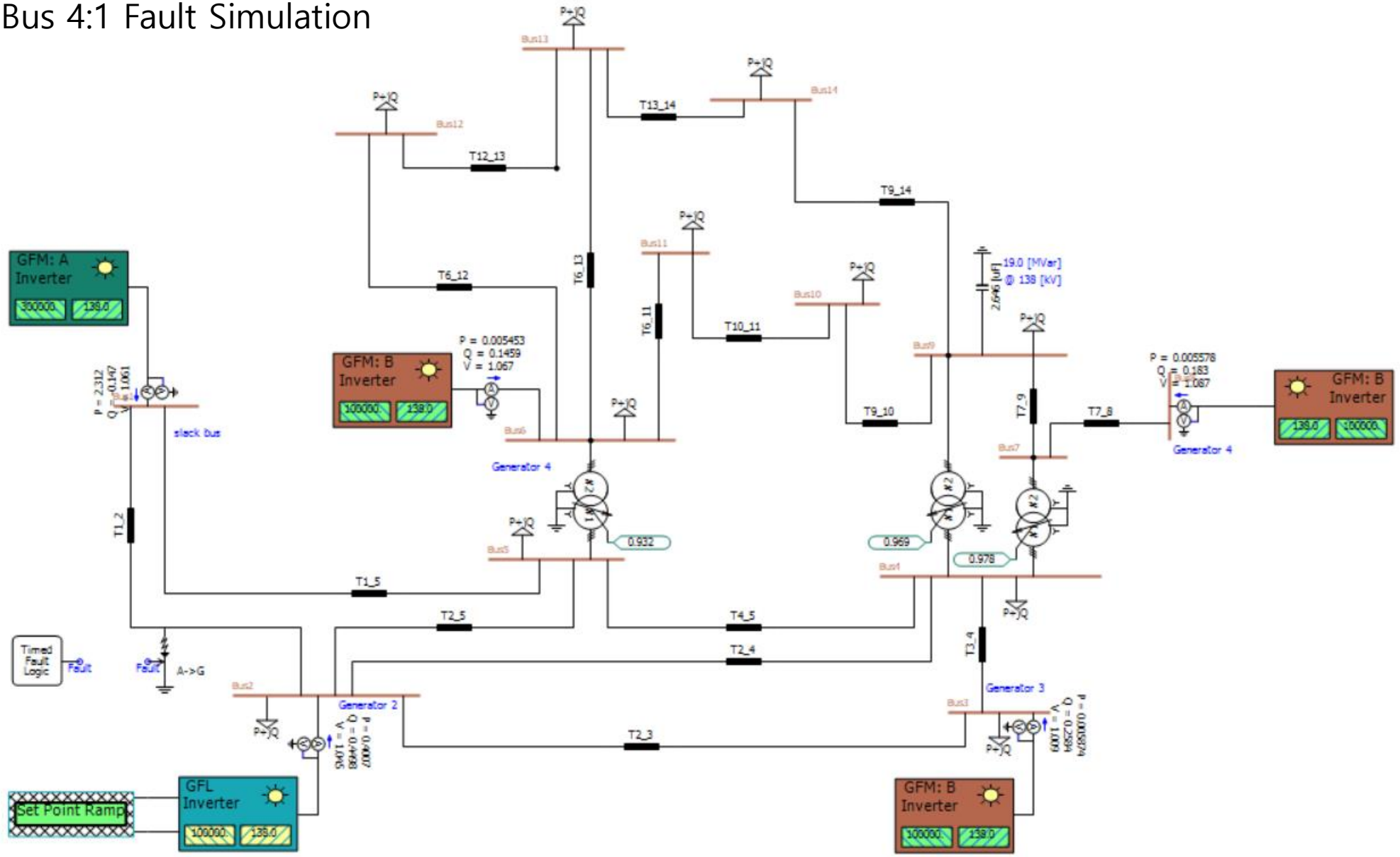


IEEE 14 Bus 5:0 Fault Simulation

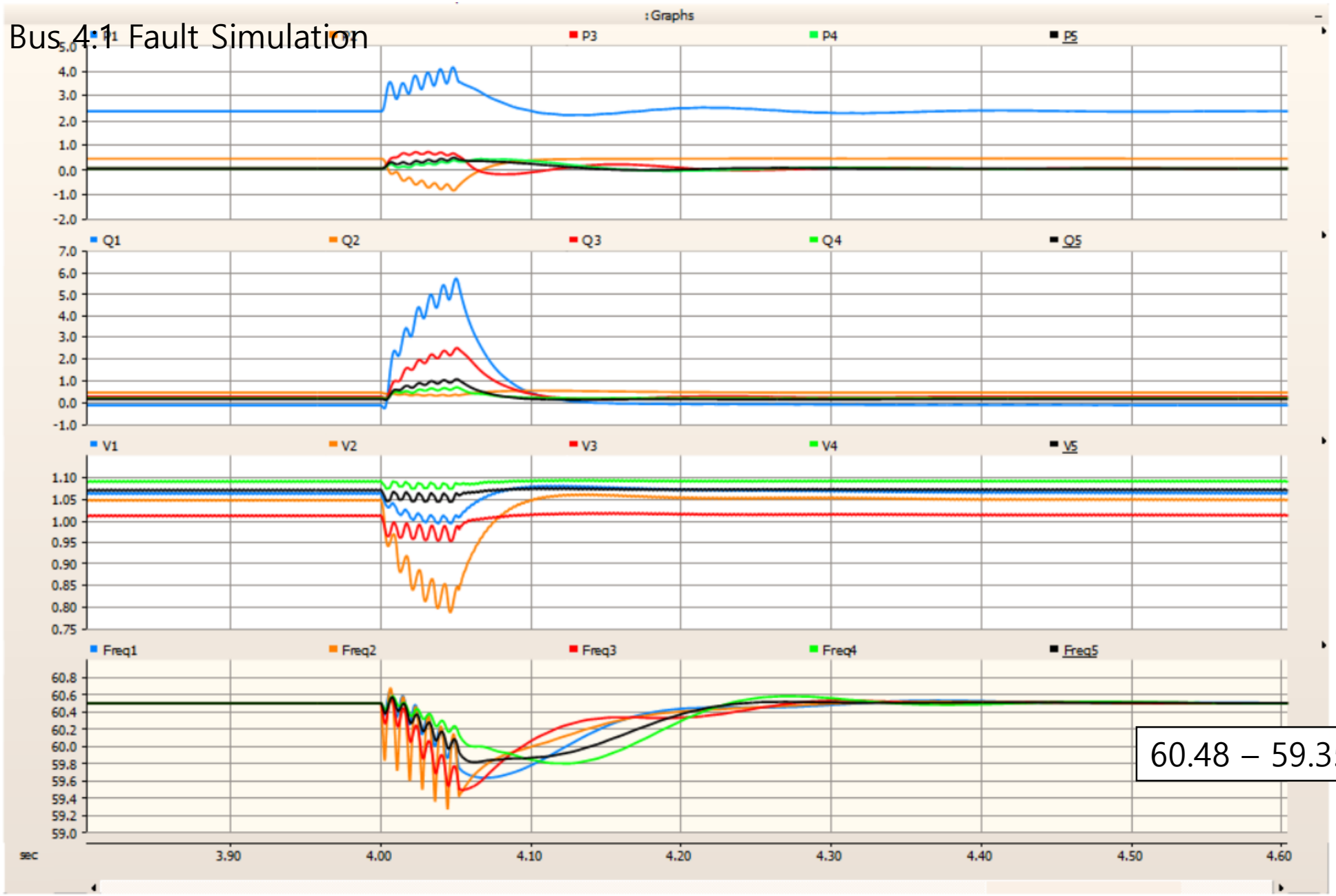


60.42 - 59.84 =0.58

IEEE 14 Bus 4:1 Fault Simulation

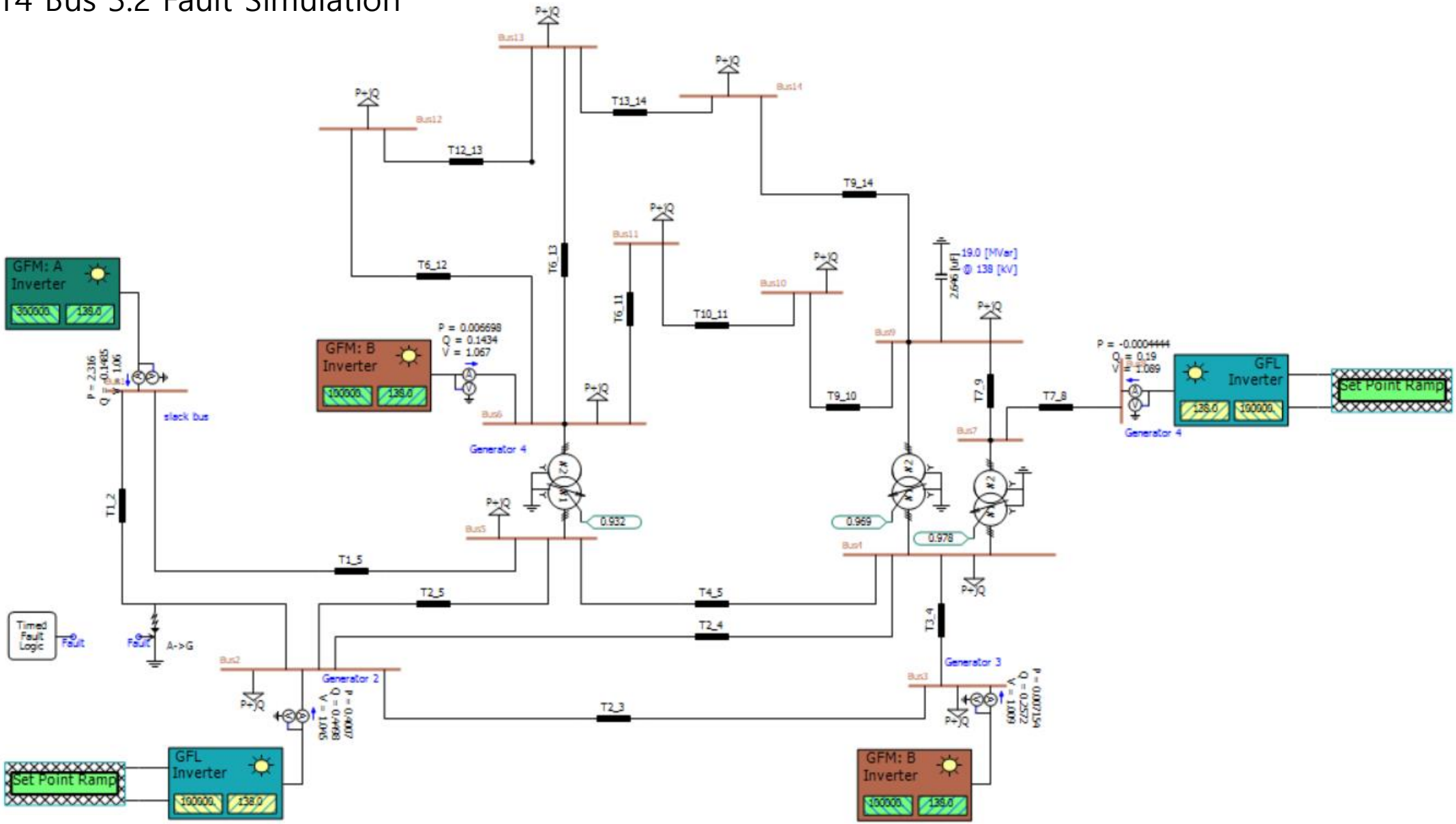


IEEE 14 Bus 4:1 Fault Simulation

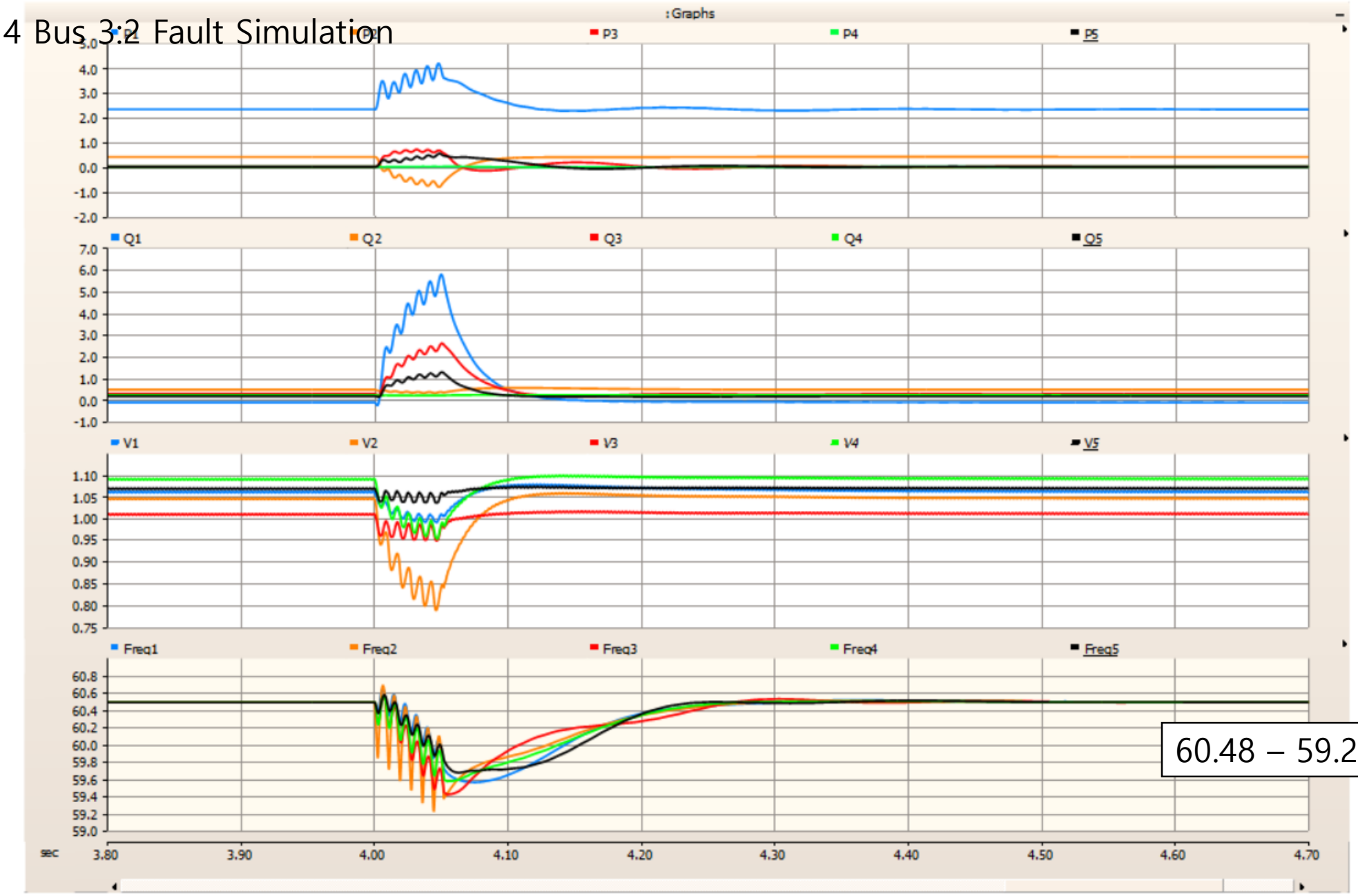


60.48 – 59.35 = 1.13

IEEE 14 Bus 3:2 Fault Simulation

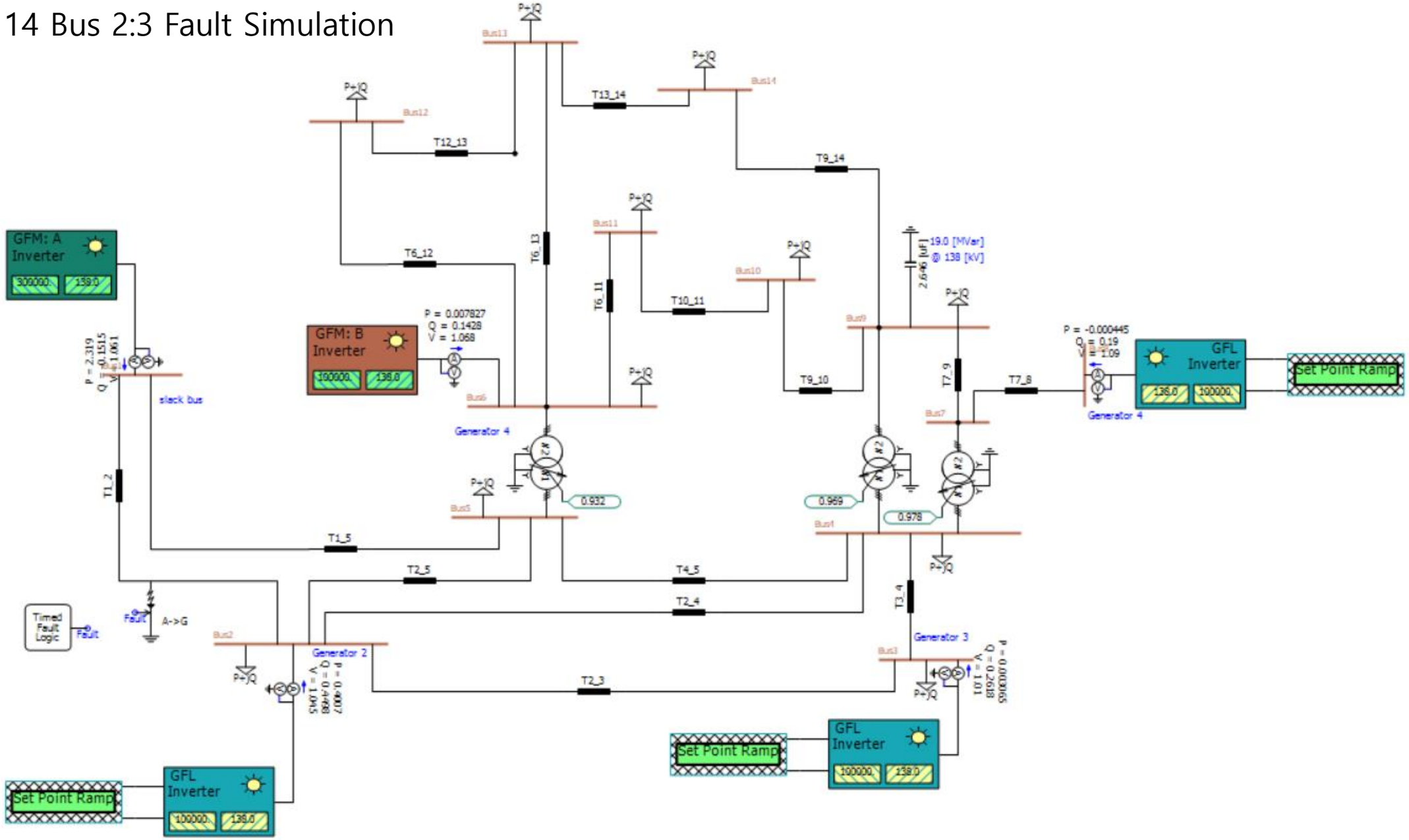


IEEE 14 Bus 3:2 Fault Simulation

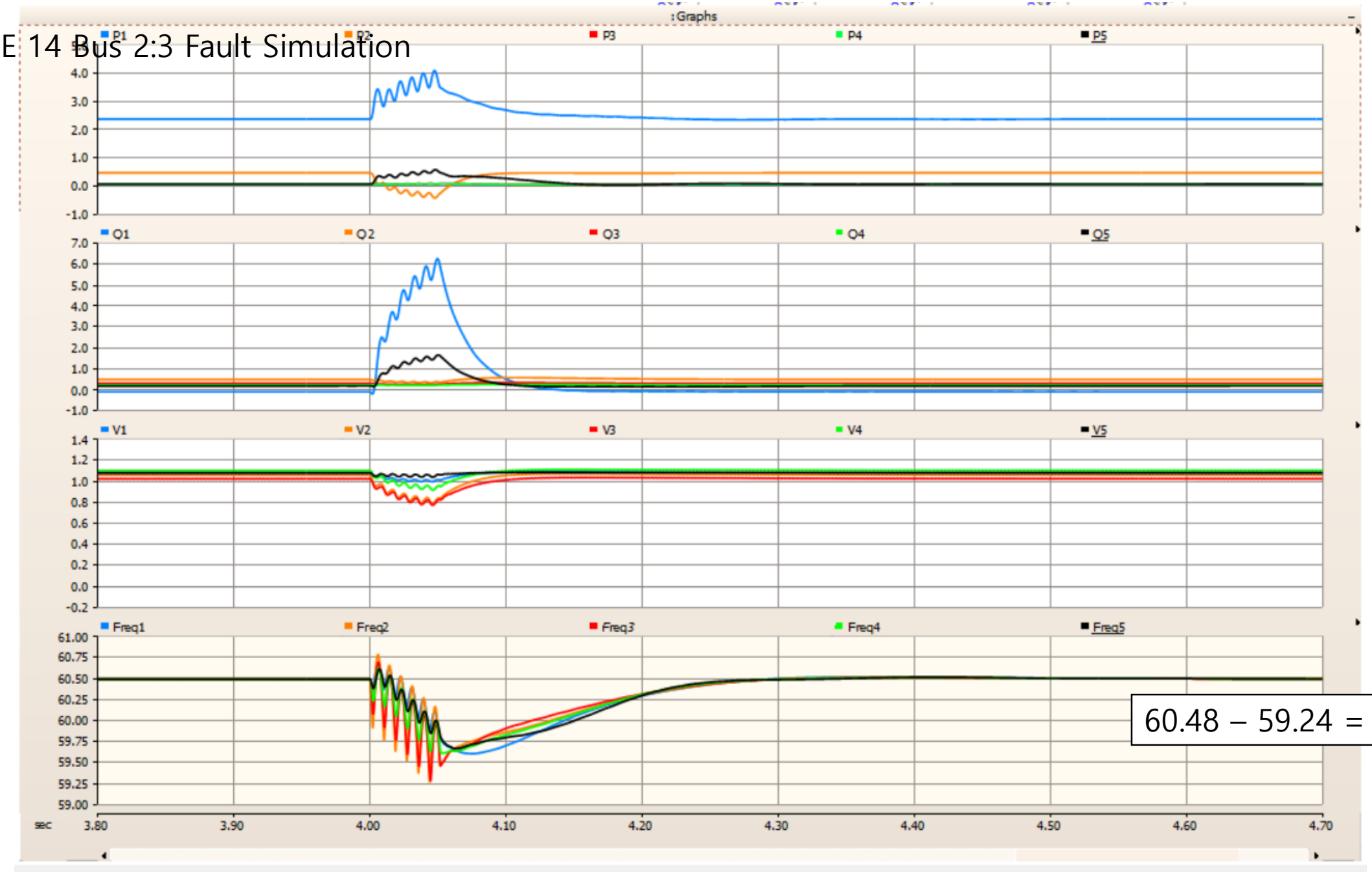


60.48 – 59.26 = 1.22

IEEE 14 Bus 2:3 Fault Simulation

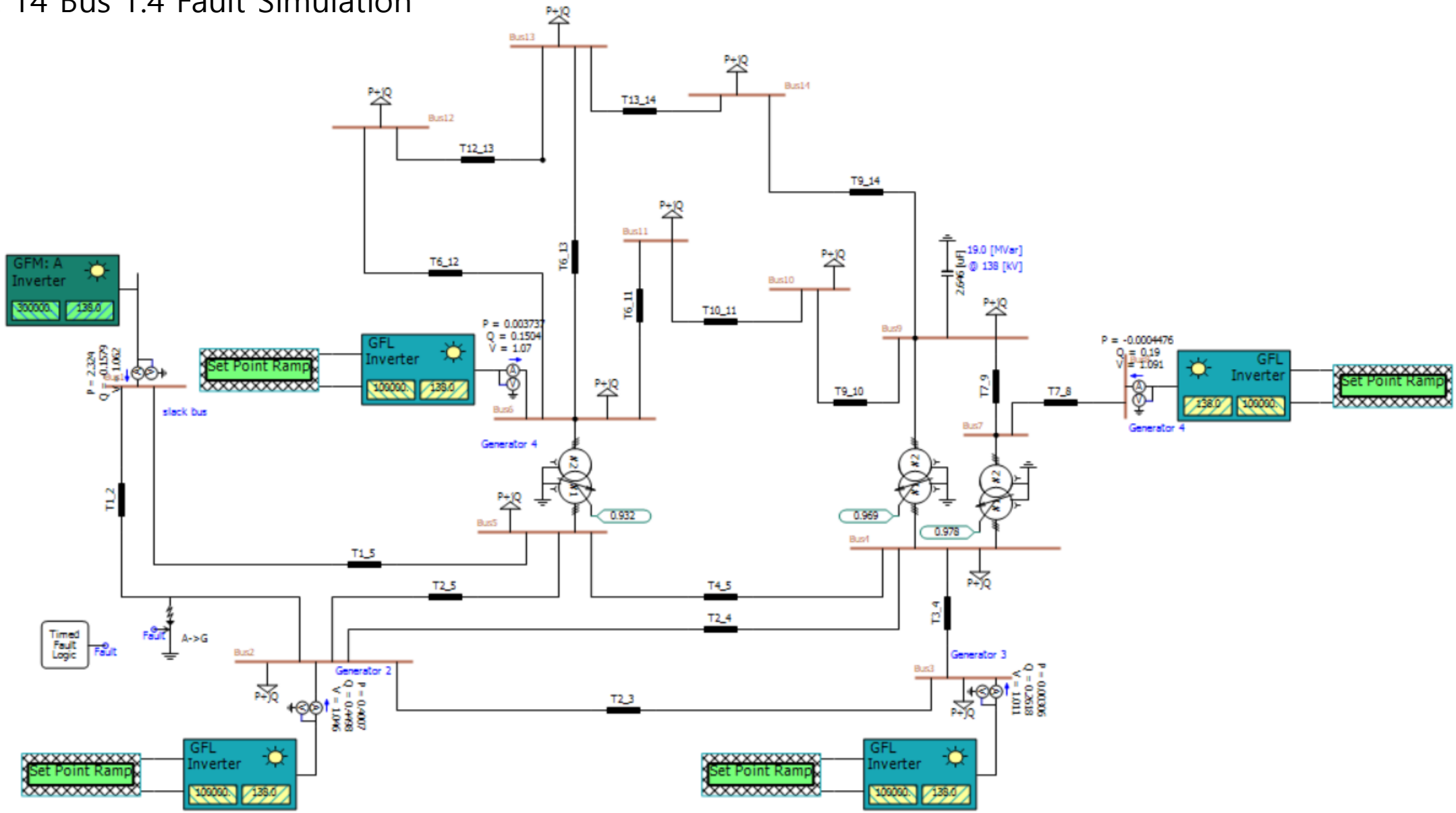


IEEE 14 Bus 2:3 Fault Simulation

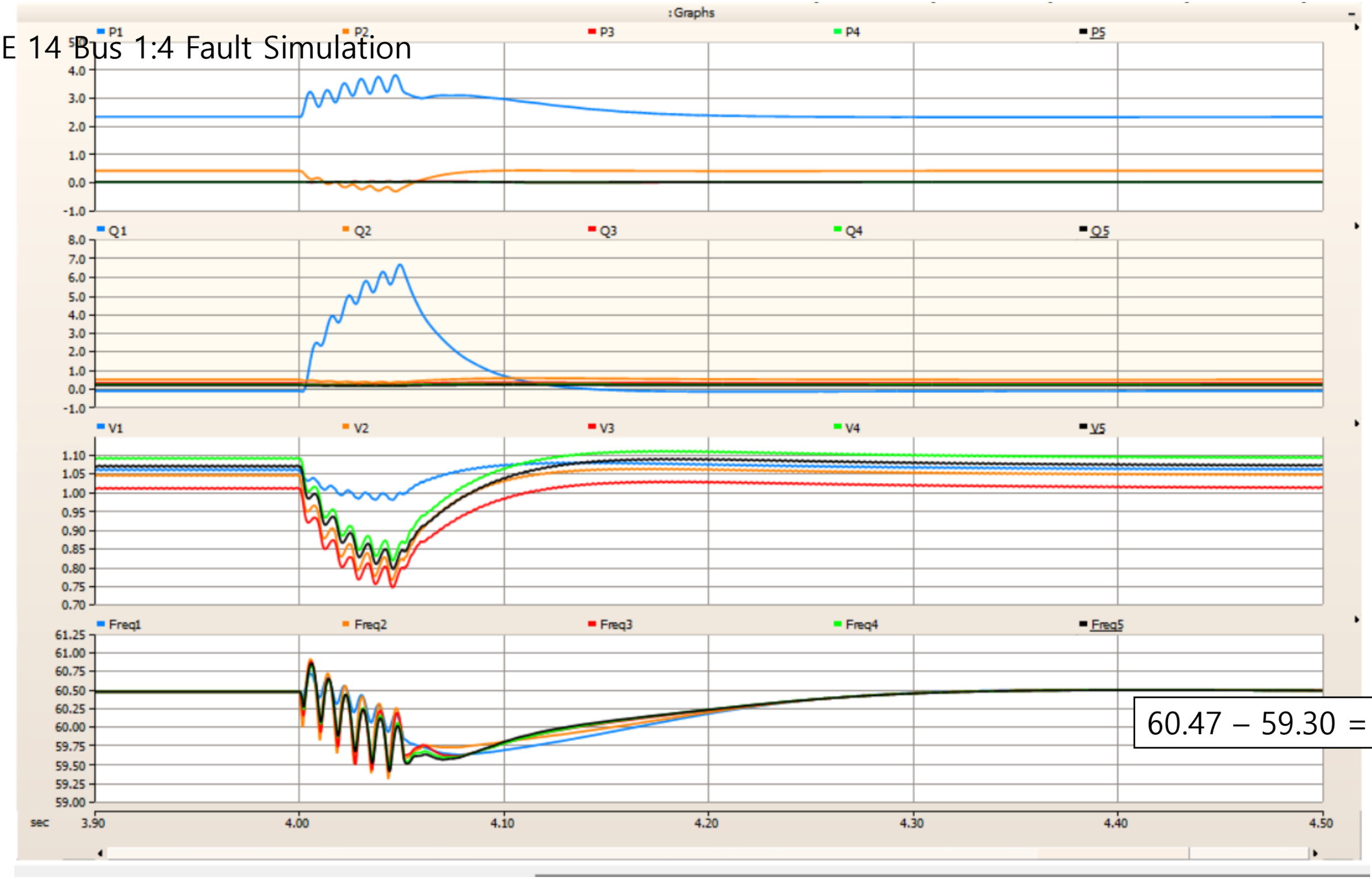


60.48 – 59.24 = 1.24

IEEE 14 Bus 1:4 Fault Simulation



IEEE 14 Bus 1:4 Fault Simulation

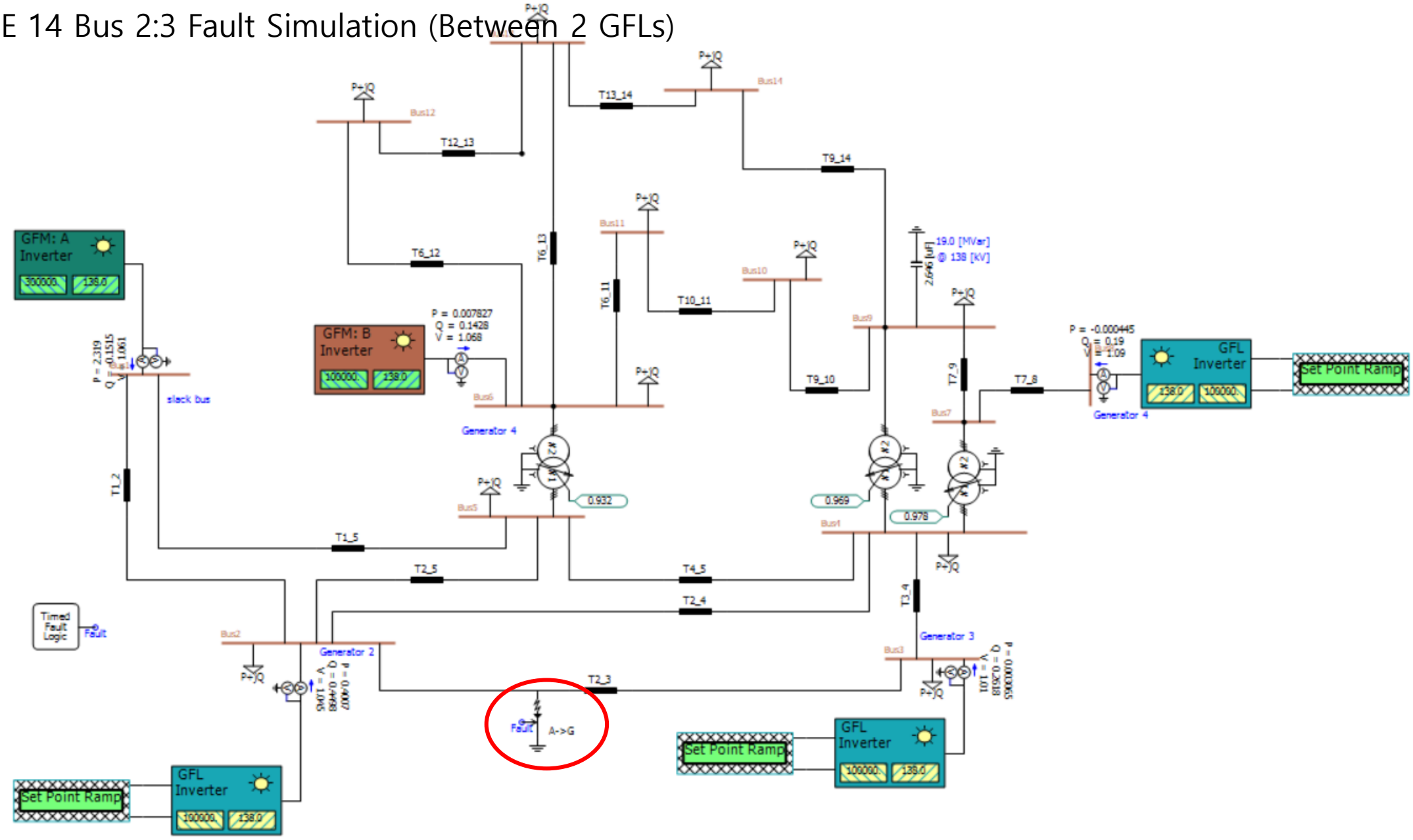


60.47 – 59.30 = 1.17

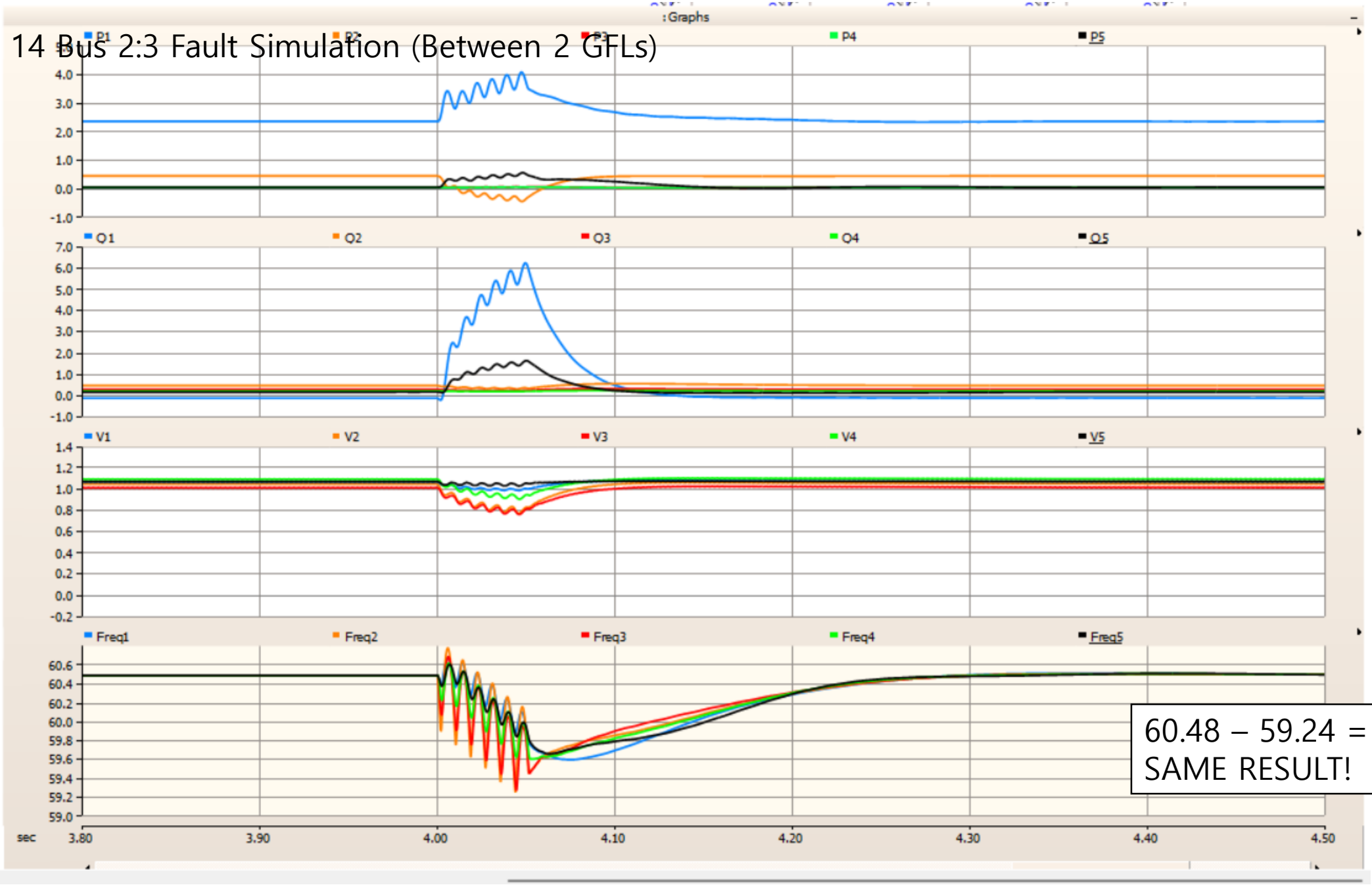
Observations and Thoughts

- Fault 생길 때 모든 케이스의 경우 그렇게 많이 떨어지는 frequency가 없었다.
- 전체 GFM 외 결과를 보면 거의 비슷한 f_{nadir}를 확인할 수 있다.
- Fault 때, GFL 쪽에 f는 많이 흔들린다 (LPF 통과해도 oscillation)
- Fault의 위치가 바로 GFM 쪽에 있기 때문에 그렇게 많이 떨어지지 않을 수도 있다고 생각한다.
  - 다른 곳에서 fault 시켜서 simulation을 더 진행
  - 특히 두개의 GFL사이에 fault 시킨다.

IEEE 14 Bus 2:3 Fault Simulation (Between 2 GFLs)

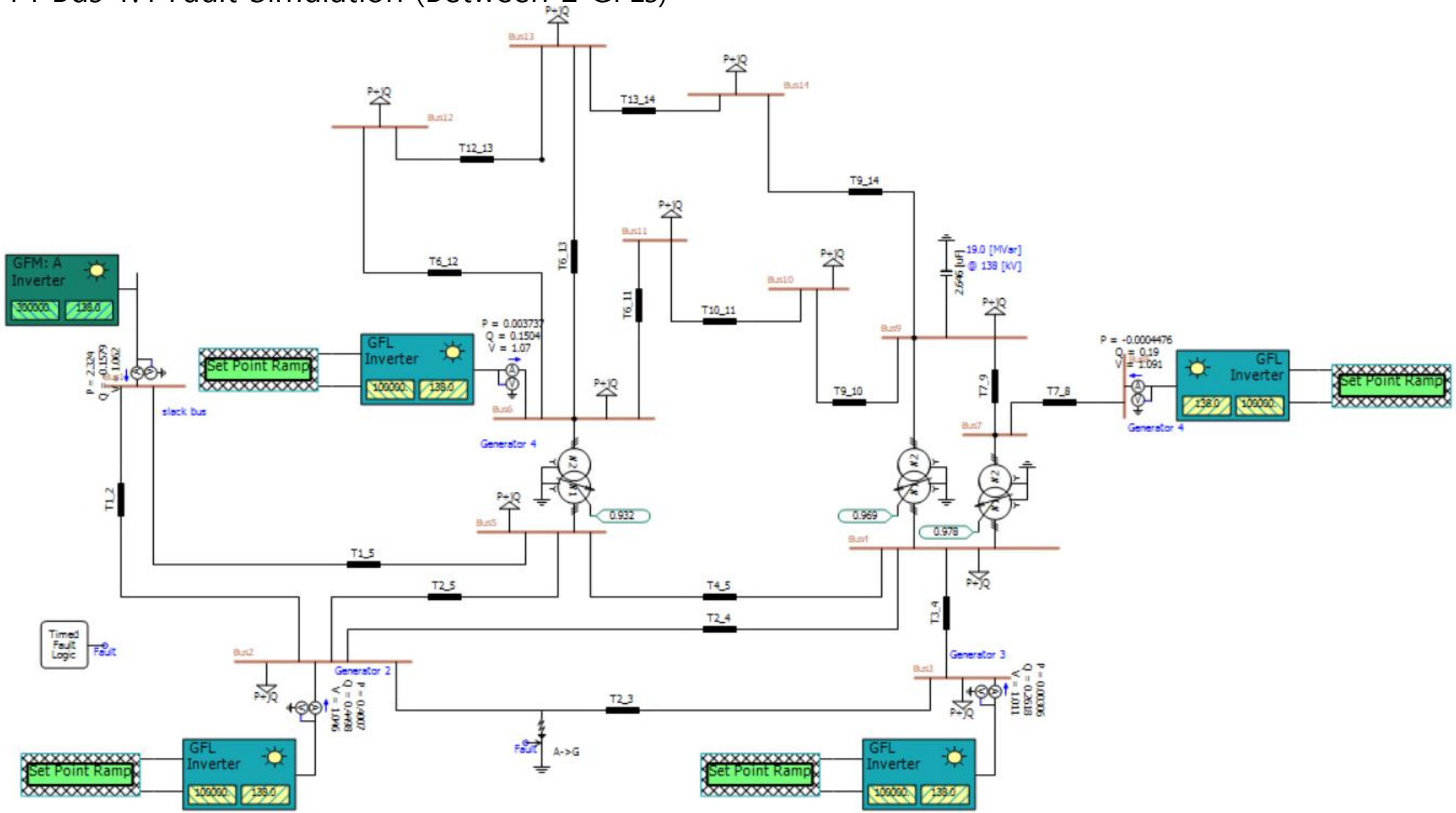


IEEE 14 Bus 2:3 Fault Simulation (Between 2 GFLs)

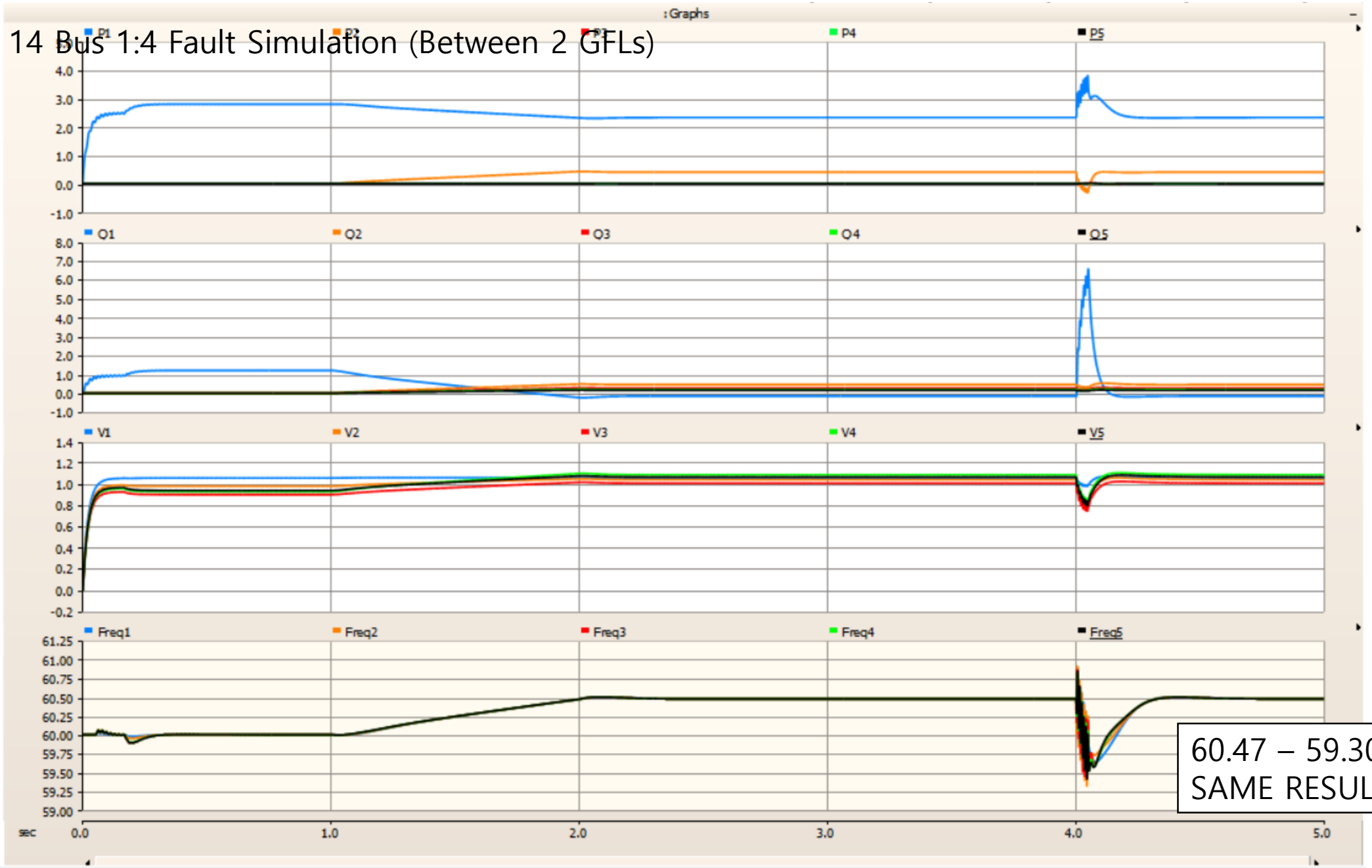


60.48 – 59.24 = 1.24
SAME RESULT!

IEEE 14 Bus 1:4 Fault Simulation (Between 2 GFLs)

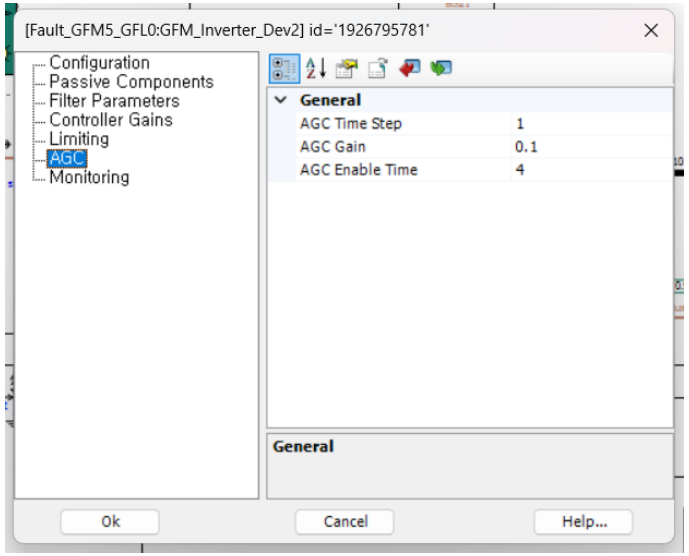


IEEE 14 Bus 1:4 Fault Simulation (Between 2 GFLs)

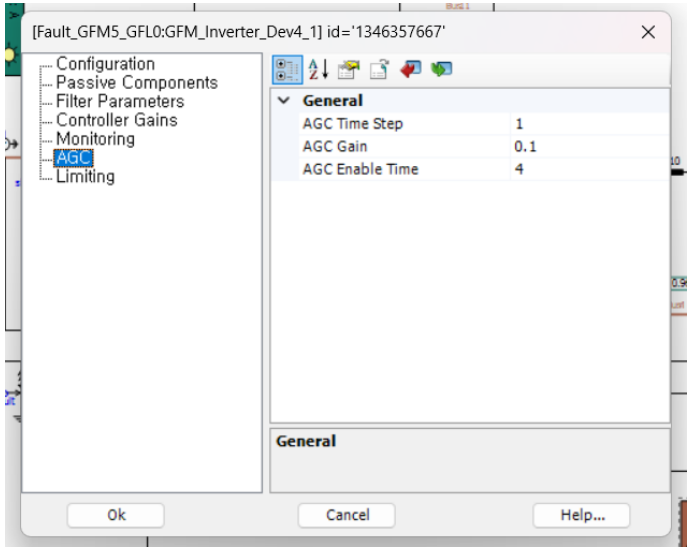


60.47 – 59.30 = 1.17
SAME RESULT!

IEEE 14 Bus 5:0 Fault Simulation (ACG Activate)



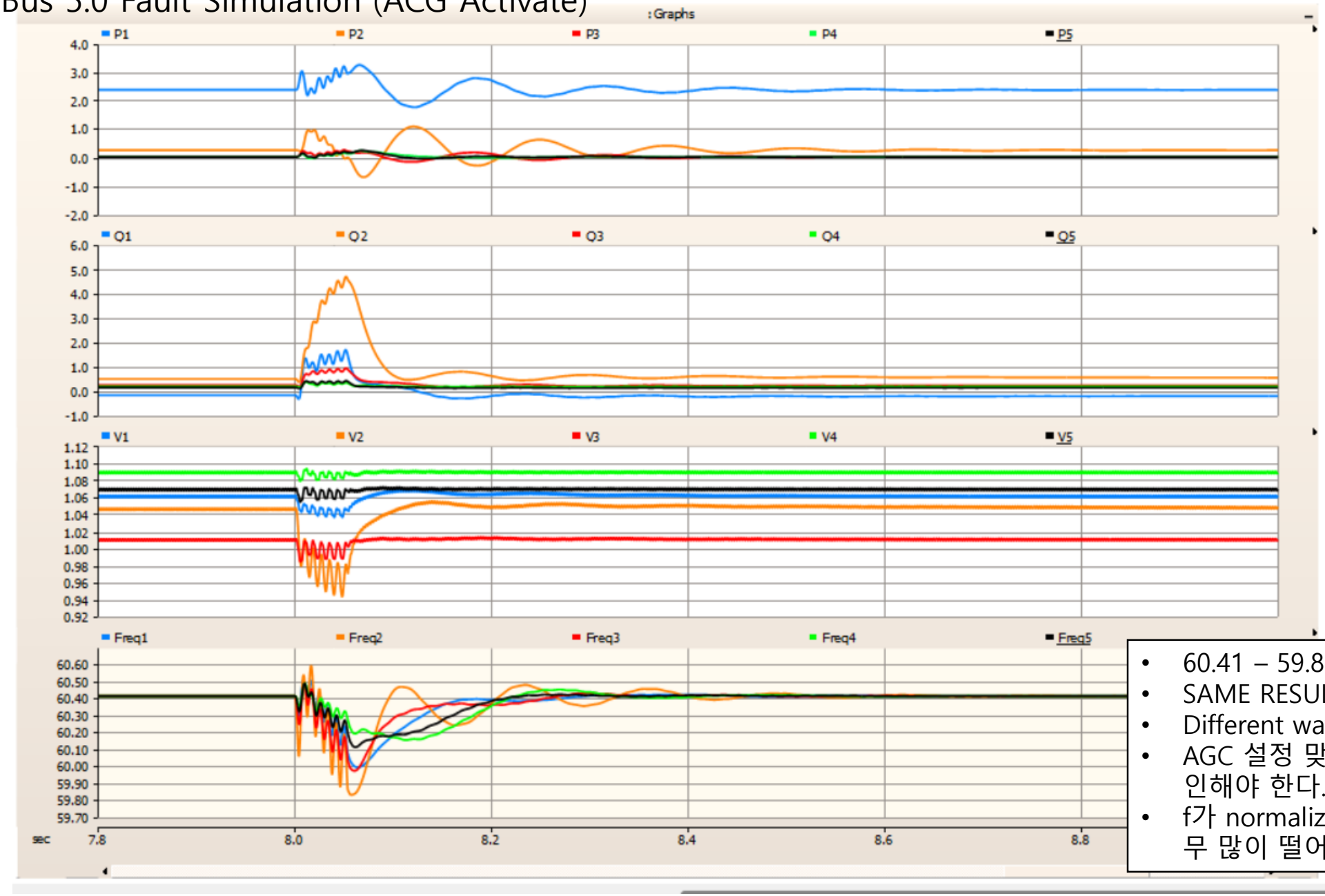
GFM A



GFM B

60.47 – 59.30 = 1.17
SAME RESULT!

IEEE 14 Bus 5:0 Fault Simulation (ACG Activate)



- 60.41 – 59.83 = 0.58
- SAME RESULT!
- Different waveform
- AGC 설정 맞는지를 확인해야 한다.
- f가 normalized 값에 너무 많이 떨어져서..