EE160 Lab Assignment-3

Lab section 1A

Power Measurement in 3-Phase Electric Circuit

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Objectives:

On Simulink, design a circuit with Y-connected 3-phase AC sources (220V, 50 Hz) and Y-connected 3-phase RLC branch.

Parameters:

Input voltage = 220V

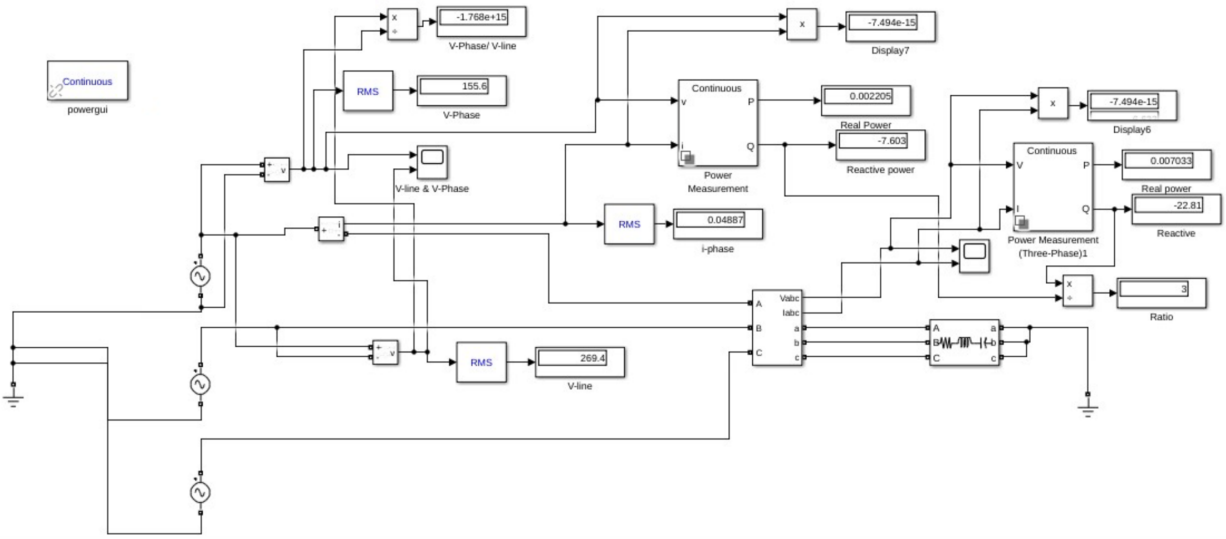
Frequency = 50Hz

Phase of A= 0
Phase of B = -120

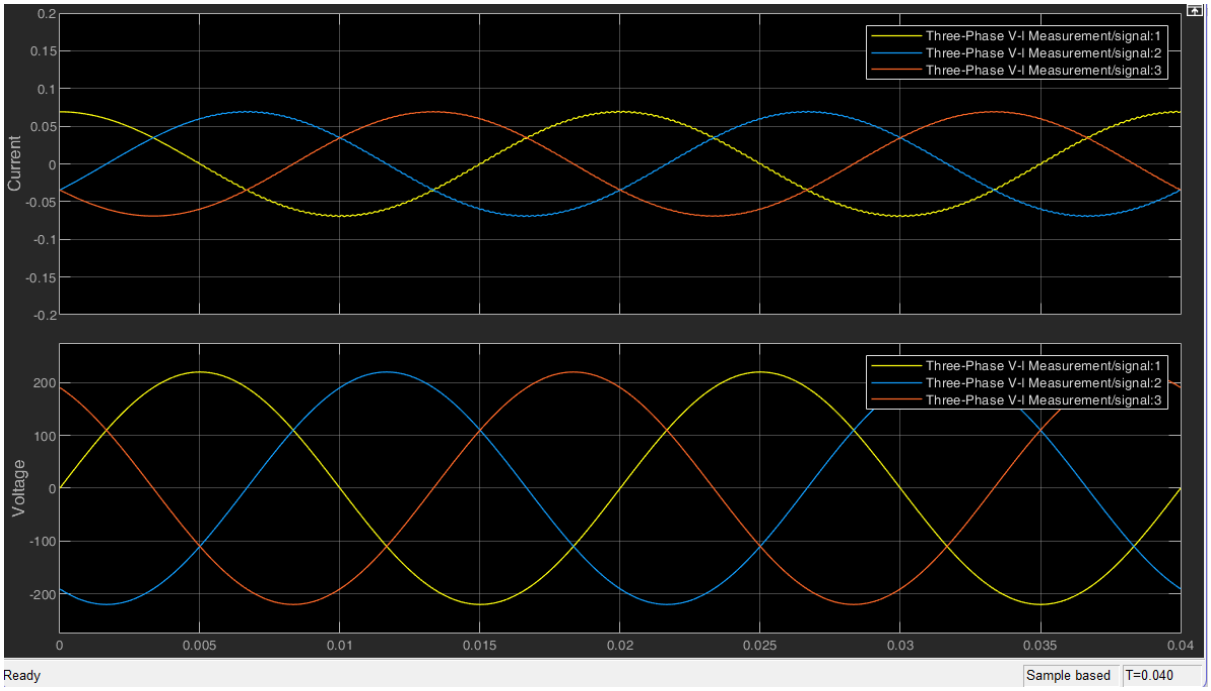
Phase of C = -240

R=1 Ω L=10^{-3} H C=10^{-6} F

Circuit :



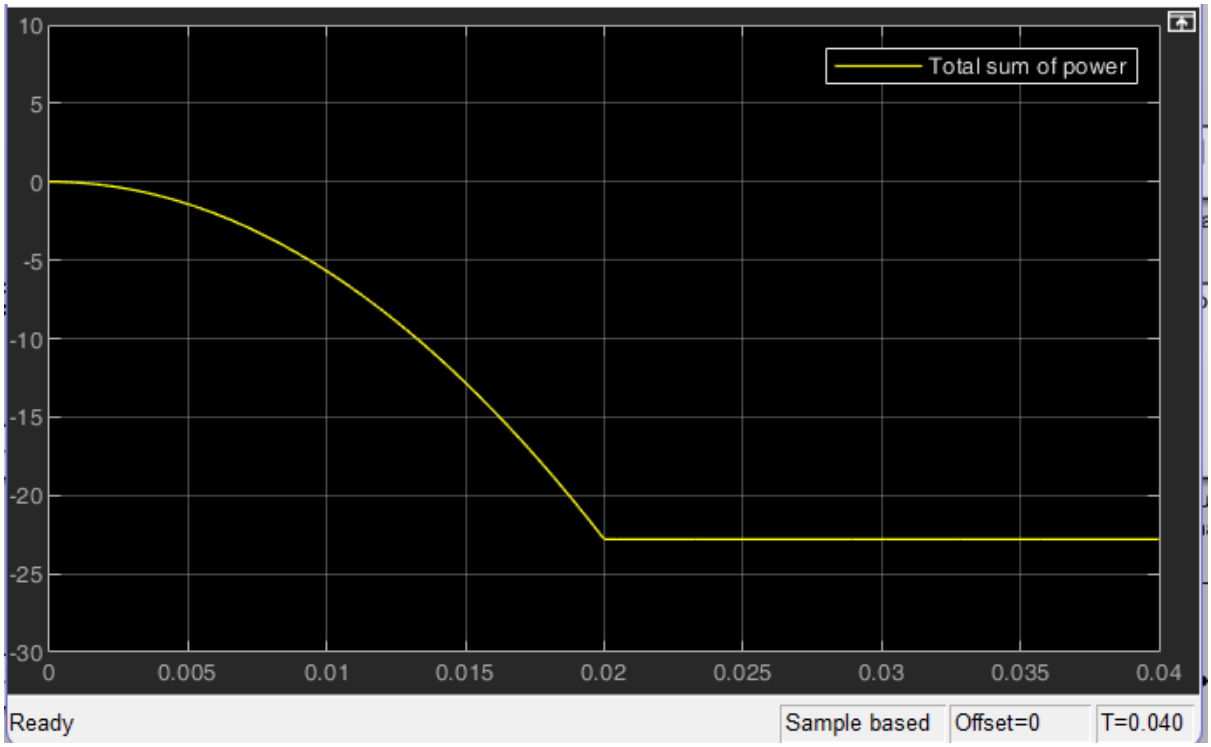
Scope 1 : Three Phase Current And Voltage



Result:

At any point the sum of current of phase A, B and C is equal to Zero.

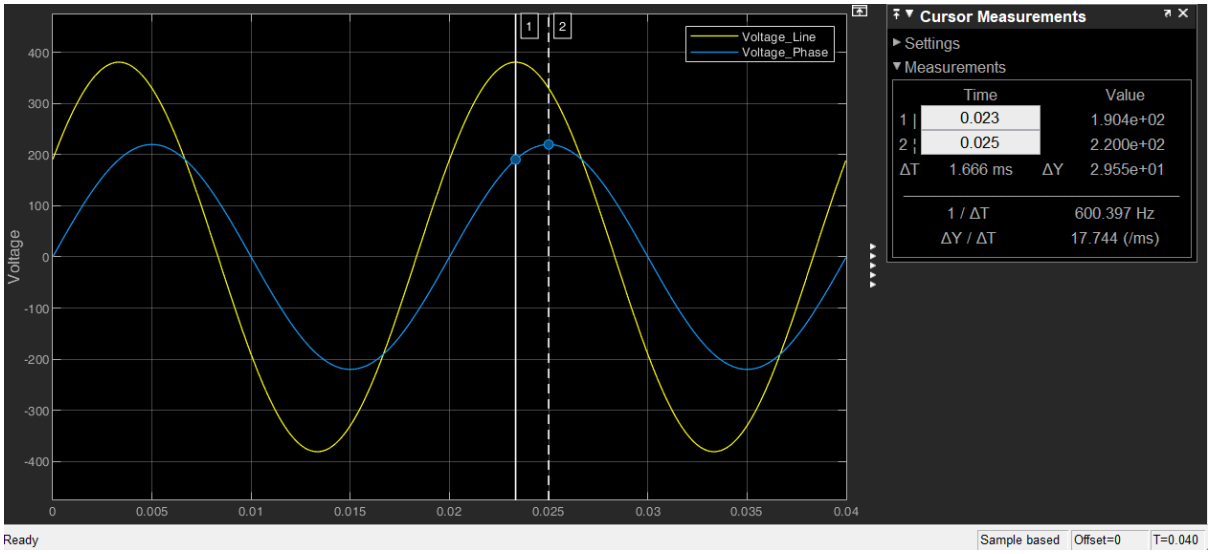
Scope 2 : Total Power (Reactive + Real)



Result :

The total power in a three-phase power system is constant with respect to time(after steady state), which can be verified through this graph.

Scope 3 : V_line and V_phase Graph



Result:

- ● ΔT between the peaks of V_phase andV_linecomes out to be 1.666 ms As Phase Difference = ωΔt

  = 2πf×Δt
  = 2πf×1.666×0.001 = 0.523

  Which is in radians, when we convert it into degrees,it comes out to be 29.998 degrees which is approximately equal to 30 degrees.

  Therefore, V_phase leads V_line by 30 degrees.

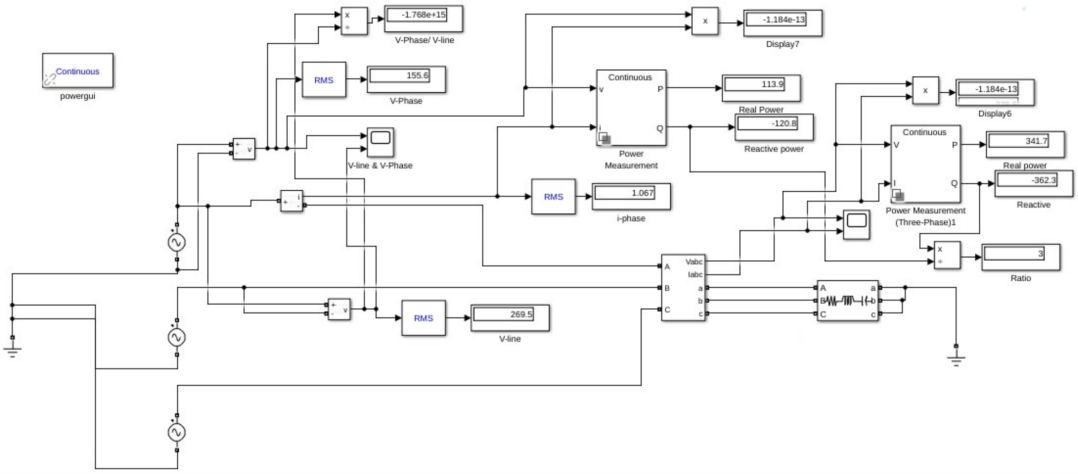
- ● Also through Display, V_line = 269.4 V

  V_phase = 155.6 V
  And their ratio comes out to be 1.732 .

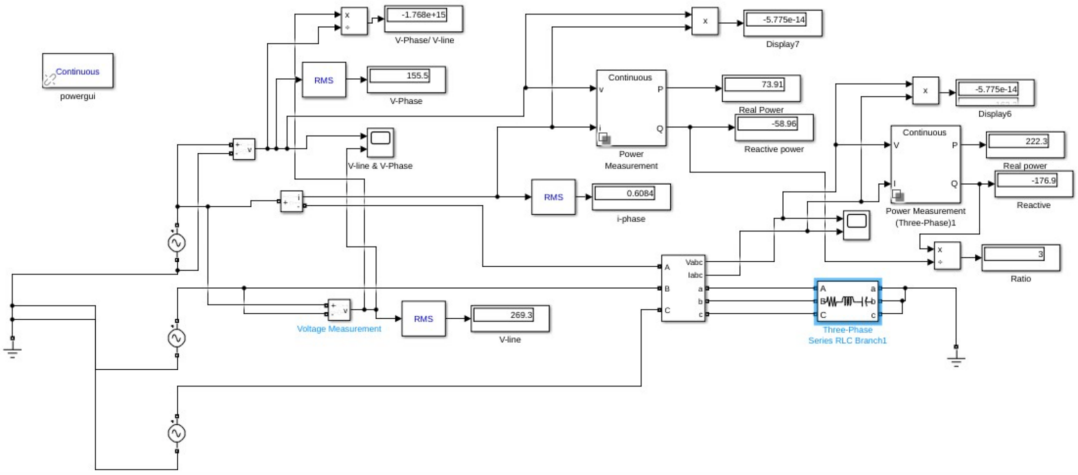
- ● Reactive Power from 3 phase power measurement is -22.81 VAR, and from Single Phase Power reactive power is -7.603 VAR their ratio is 3. Same is the case with Real power.

For other values of R,L and C :

For R=100 Ω ,L=10^{-4} H,C=10^{-5} F



For R=200 Ω ,L=2×10^{-4} H,C=2×10^{-5} F



All the properties of Graphs and circuit remain the same, just value differs in these two cases.

Conclusions:

1. V_line is $\sqrt{3}$ times the V_phase voltage , I_line = I_phase.
2. 3-Phase Power is 3 times the Single phase power.
3. V_line leads V_phase by 30 Degrees.
4. Total power of the system is constant.
5. At any point the sum of current of phase A, B and C is equal to Zero, that's why current through the neutral line is zero.