

ECE 470 POWER SYSTEMS I

Lab # 1 Introduction to Power Lab Equipment

The objective of this lab is to become acquainted with some of the basic measurement techniques and equipment in the power lab.

PRE-LAB

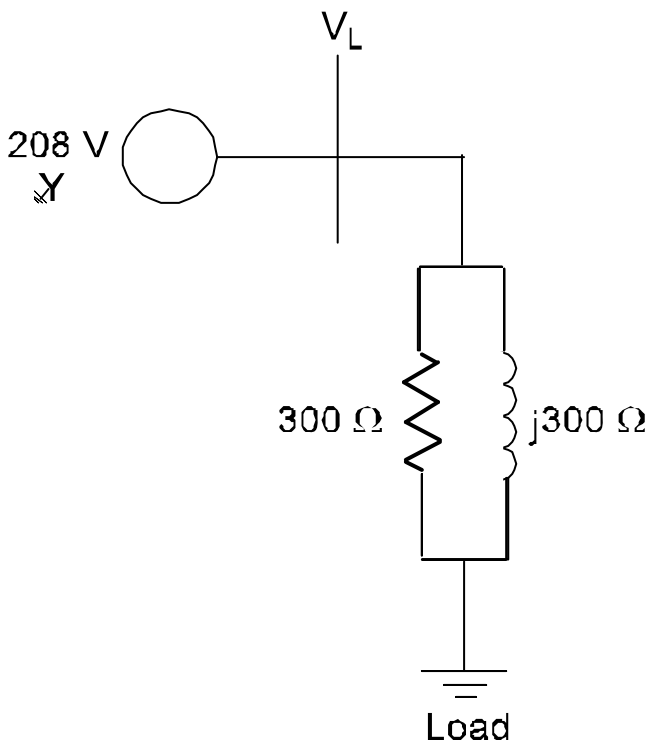
Complete this before starting the lab

Calculate the following quantities when a three-phase Y-connected load of $300\ \Omega$ in parallel with $0.8\ \text{H}$ is supplied from a $208\ \text{V}$ (line) $60\ \text{Hz}$ supply:

- Phase-neutral voltages.
- Line currents.
- Real, reactive, and apparent power.
- Power factor and phase angle.

Recall that the inductors draw a few watts each, so you should add about $10\ \text{W}$ to the predicted real power.

For the one-line diagram shown below, devise circuit diagrams that will measure the above quantities. Use the Yokogawa power meter and oscilloscope for this.



LAB PROCEDURE

Get your circuit approved before starting

Connect the variable 3ϕ supply to the Yokogawa power meter in the 3ϕ 4-wire mode. Use this to supply the 3ϕ , Y-connected load of $300\ \Omega$ in parallel with $0.8\ \text{H}$.

Attach CH1, CH2 and CH3 to phases A, B and C respectively. Attach the current probe to CH4. Set the supply to $120\ \text{V}$ phase ($208\ \text{V}$ line) and display all phase-neutral voltages. Have CH4 turned-off for the time being.

Compare the voltage magnitudes obtained from the scope with those from the Yokogawa. You will need to set the scope on **20X** for its probe; do this by pressing **CH1 MENU** then press **Probe 10X Voltage**, then press **Attenuation 20X**. Repeat for CH2 and CH3. Press **MEASURE** and adjust **Type** to **Cyc RMS** to read the voltage.

Press **MATH MENU** and adjust **Operation** to **-** for **Sources CH – CH2**. This will produce the line voltage V_{AB} . Confirm that this voltage magnitude is $\sqrt{3}$ times bigger than the phase-neutral voltage and is 30° behind (why isn't it 30° ahead?)

Attach the current probe to phase C and turn-on CH4 to display I_C . Confirm that it is roughly 45° behind V_{CN} .

Return to **MATH MENU** and set **Operation** to **x** with **Sources** set to **CH3 x CH4**. Press **Application** and then press **Power Analysis**. Set **Sources** on **CH3 & CH4** and confirm the values of the quantities predicted in the pre-lab. Note that the Yokogawa presents total three-phase values while the scope presents single-phase values.

Write a conclusion that summarizes what you have learned.