Step-by-step guide to designing a LL matching network.

- **LL matching networks are commonly used to provide broad-band matching.**
- **Designing a LL network is similar to the π and T networks. You're basically creating two L networks, one for the source side and one for the load side, BUT:**
  - Both L networks will have the same Q value.
  - Both L networks will be HighΩ-LowΩ, (step-down) or both wil be LowΩ-HighΩ (step-up).
  - The 'virtual' resistance 'R_V' replaces R_P for one of the L networks, and R_S for the other.
  - No components are combined as they are in the π and T networks.
  - Remember to place the X_P's next to the LARGER R-value!

NOTE: FOR CONVENTION CONSISTENT WITH CLASSROOM MATERIALS, THE FOLLOWING NOMENCLATURES ARE USED:

- X_{S1}, X_{P1} ARE THE LEFT SIDE SERIES AND PARRALEL REACTANCES, RESPECTIVELY
- X_{S2}, AND X_{P2} REPRESENT THE RIGHT, (TYPICALLY LOAD-SIDE)SIDE VALUES

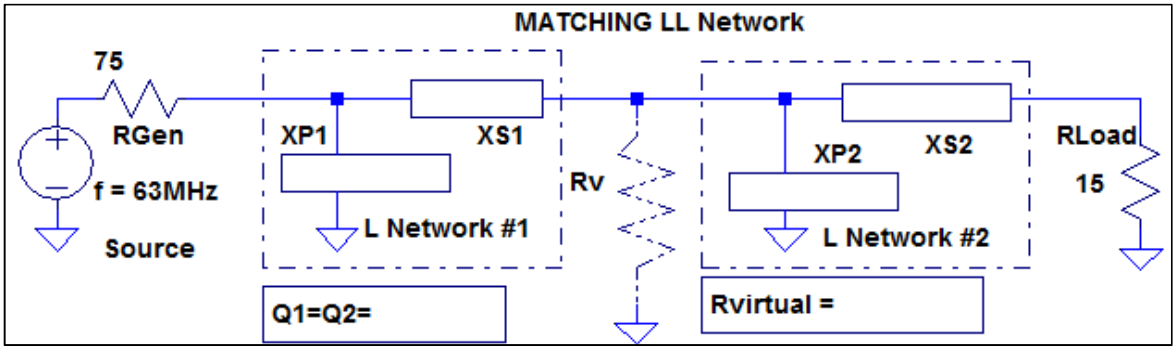


Figure 1. Matching LL Network Template. This one is a step-down example, where $R_{Gen}>R_V>R_{Load}$. In a step-up network, X_{P1} and X_{P2} would be to the right of X_{S1} and X_{S2}…

STEPS:

1. Calculate the virtual resistance value RV:
   - RV is simply the square root of the product of RS and RP:

     $R_V = \sqrt{R_{gen} * R_{Load}}$ In our example: $R_V = \sqrt{75 * 15} = 33.54\Omega$

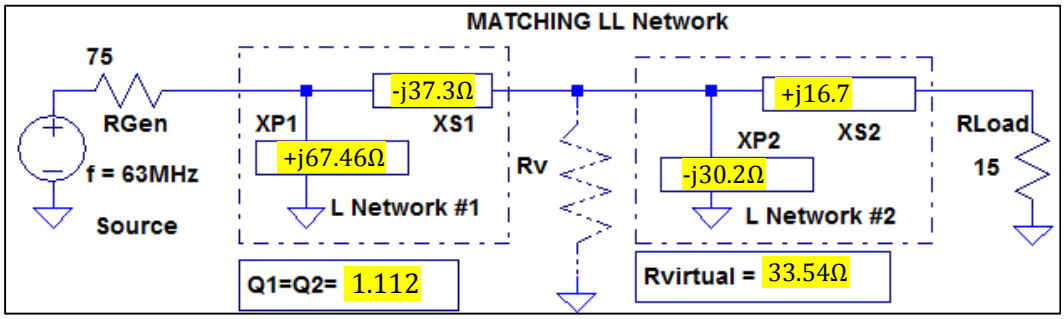
2. Calculate Q using the Q formula: $Q_1 = \sqrt{R_P/R_S - 1}$. In the example, note that the example is a step-down matching network, ($R_{gen}>R_V>R_{load}$). So R_{gen} is used in place of R_P, and R_V is used in place of R_S:

   $$Q_1 = \sqrt{R_{gen}/R_v - 1} = \sqrt{75/33.54 - 1} = 1.112$$

3. Calculate the reactances using R_V, and Q, and R_{GEN} for the source side, and R_{LOAD} for the load side.

   $X_S = +/-Q*R_S$ $X_p = \pm R_P/Q$

4. Determine whether you want HI-pass or LO-pass filters for each L network and assign ±j's accordingly. Values for a HI/LO arrangement of the example are shown here:



5. Use AC analysis to verify your work. The total impedance load seen by the generator should be equal to its source impedance.

REFERENCE MATERIAL: BOWICK, PGS. 63 - 72