

Laboratory One — Circuit Simulation With LTSpice

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Pre-Lab

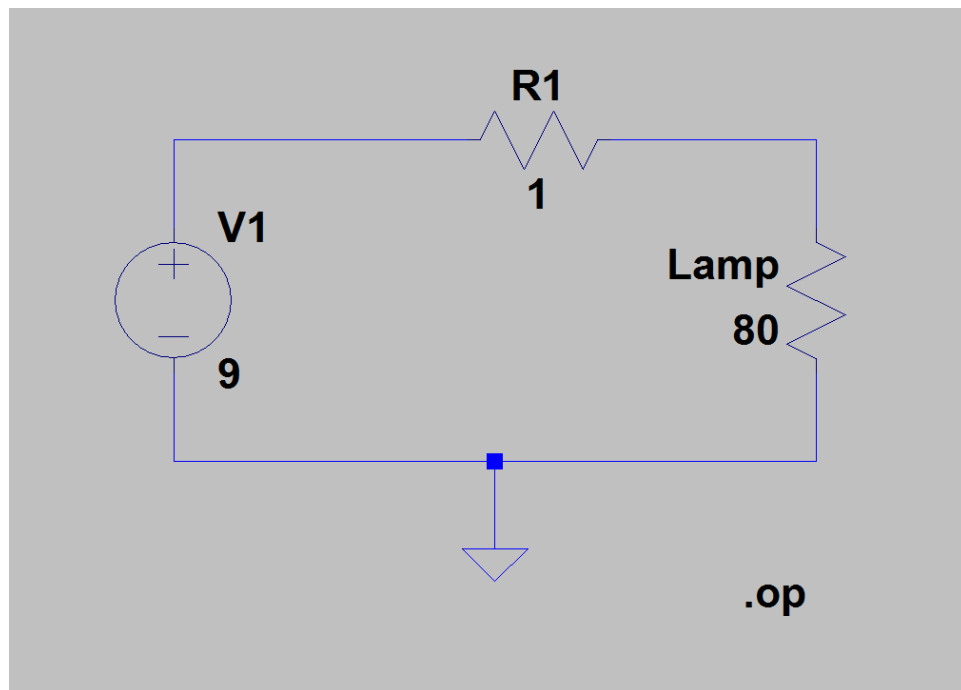


Figure 1: Lamp circuit schematic.

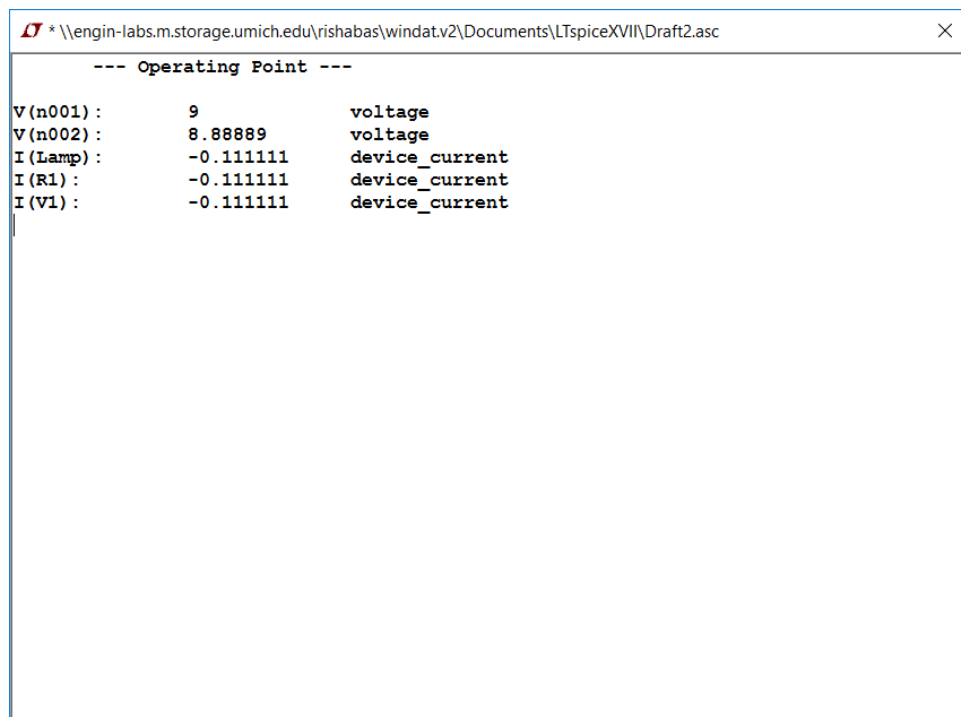


Figure 2: Element and node values for the lamp circuit.

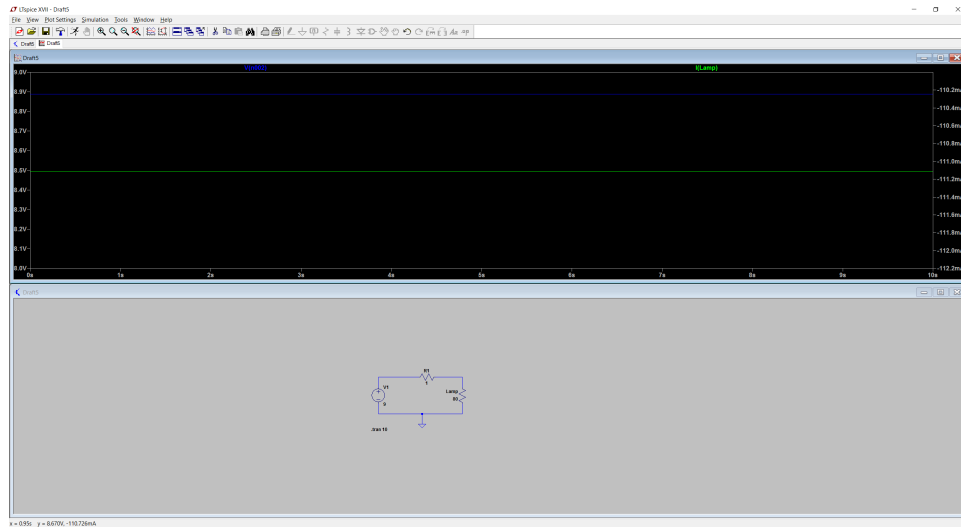


Figure 3: Graph of current through and voltage drop across the light bulb in the lamp circuit.

Post-Lab

Dependent Source Circuit

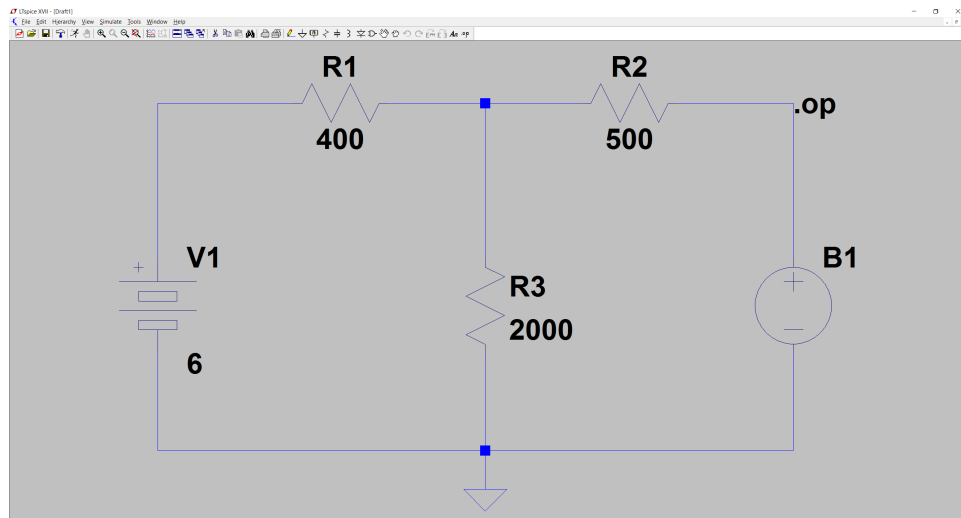


Figure 4: Dependent source circuit schematic.

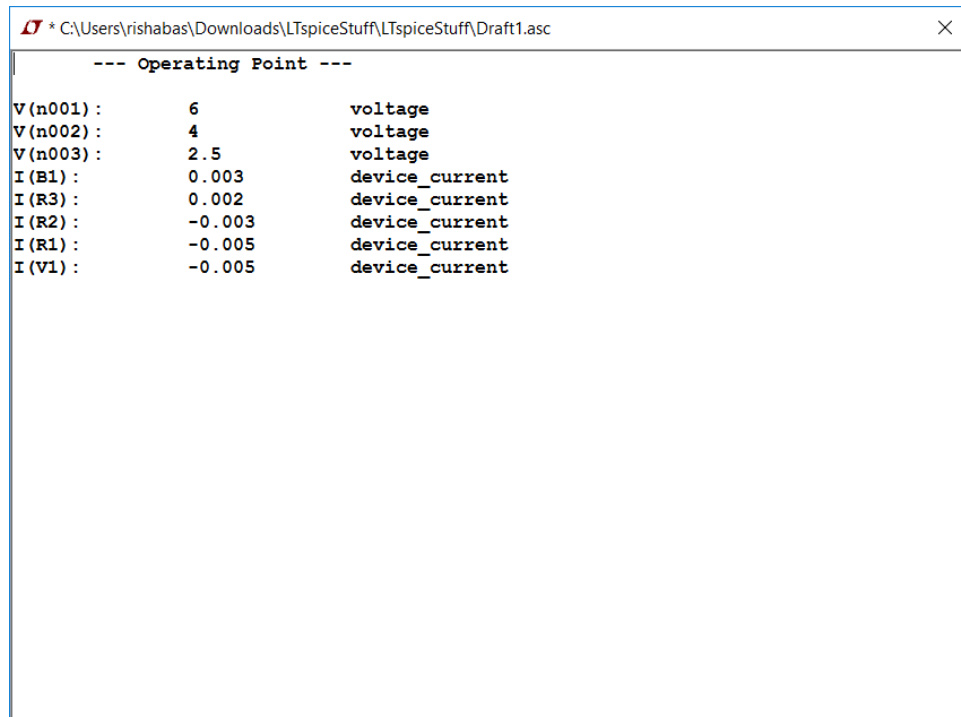


Figure 5: Element and node voltages for dependent source circuit.

$$\frac{6 - V_2}{400} + \frac{500i - V_2}{500} - \frac{V_2}{200} = 0$$

$$\frac{3}{200} - \frac{V_2}{400} + i - \frac{V_2}{500} - \frac{V_2}{200} = 0$$

$$\frac{3}{200} - \frac{V_2}{400} + \frac{6 - V_2}{400} - \frac{V_2}{500} - \frac{V_2}{200} = 0$$

$$30 - 5V_2 + 30 - 5V_2 - 4V_2 - V_2 = 0$$

$$60 = 15V_2$$

$$V_2 = 4V$$

$$i = \frac{6 - V_2}{400} = \frac{6 - 4}{400} = 0.005 A$$

$$V_{n3} = 500 \cdot 0.005 A = 2.5V$$

Figure 6: Nodal analysis by hand for the dependent source circuit.

Lamp Circuit

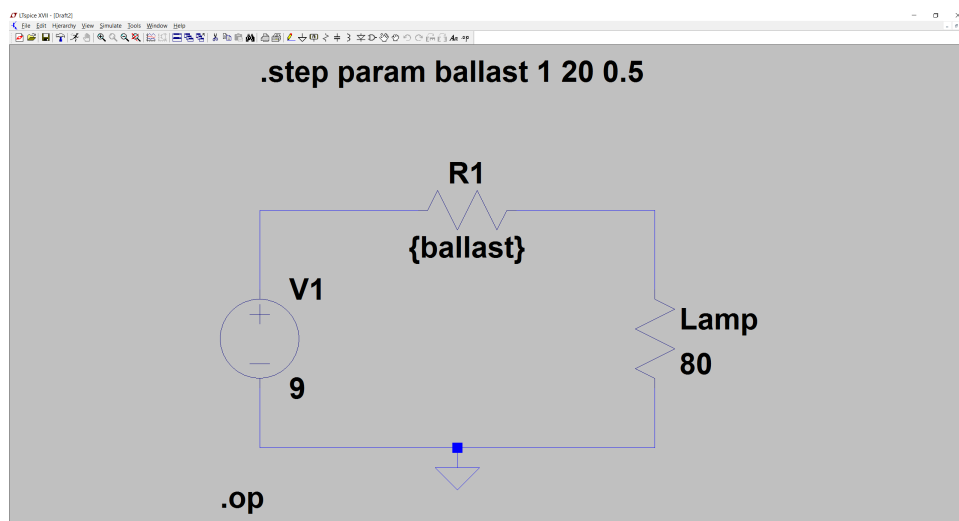


Figure 7: Lamp circuit with ballast schematic.

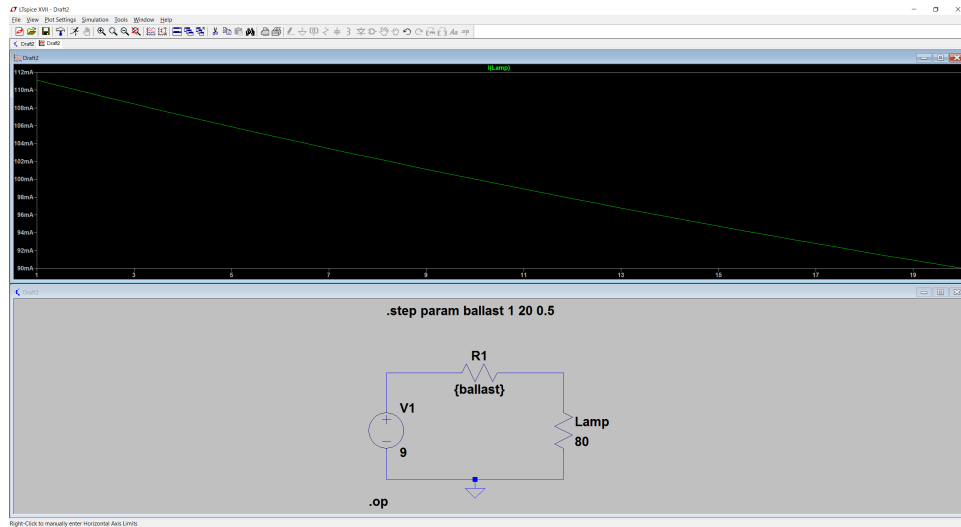


Figure 8: Lamp circuit graph of current vs. resistance.

LED Circuit

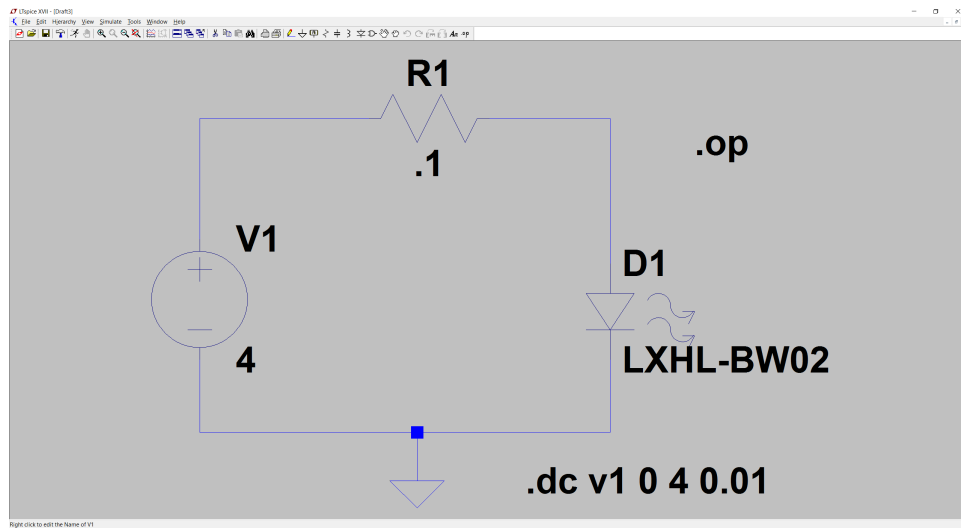


Figure 9: LED circuit schematic.

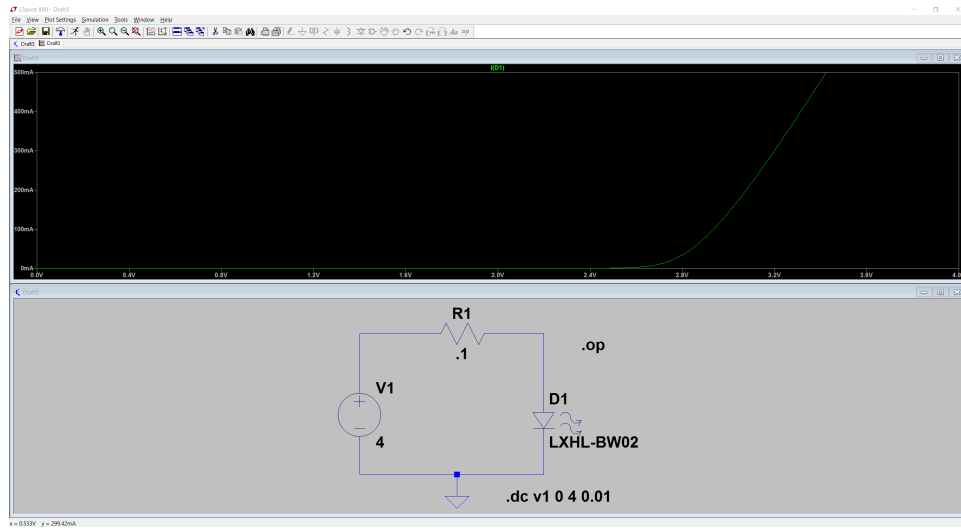


Figure 10: LED circuit graph of current vs. voltage.

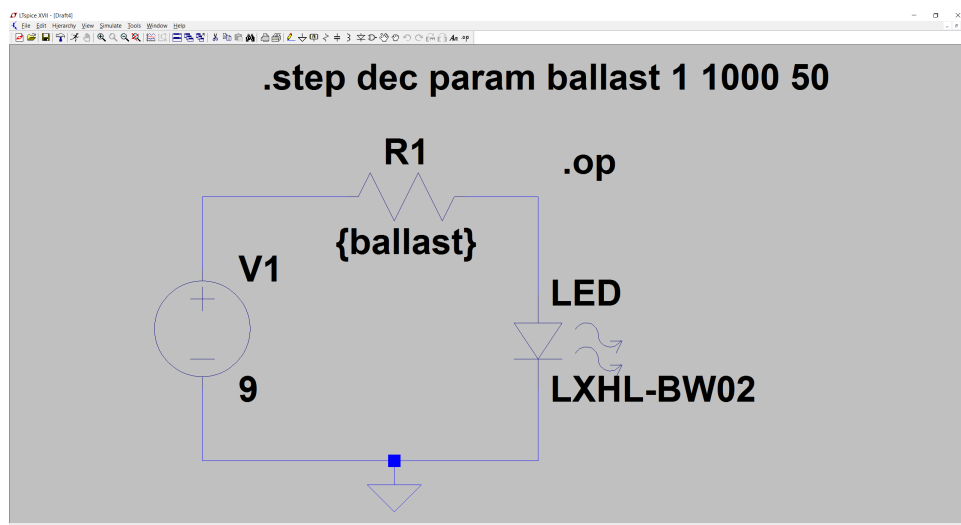


Figure 11: LED circuit with ballast schematic.

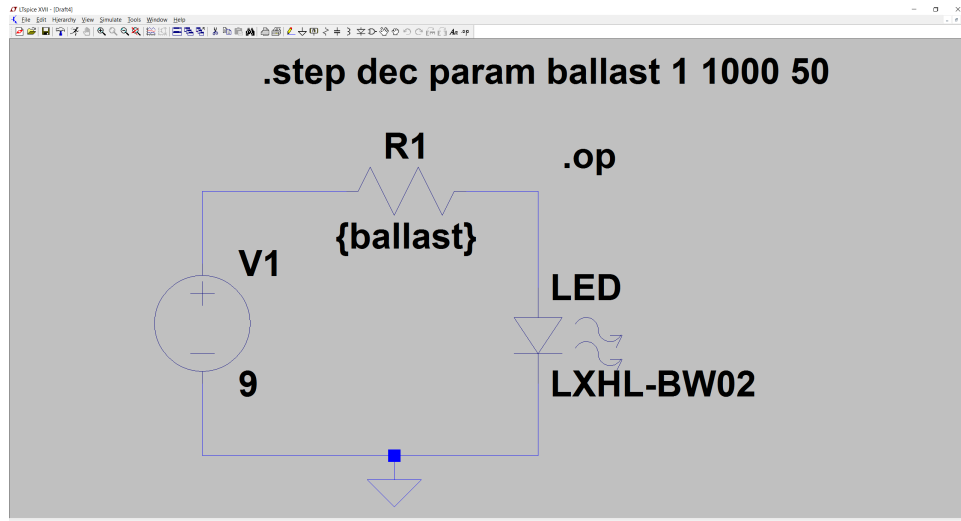


Figure 12: Graph of power consumption/absortion vs. resistance.