PRELAB 5: GUNN-DIODE OSCILLATOR

<table>
<thead>
<tr>
<th>Assigned</th>
<th>September 26</th>
<th>Goal: to learn how to do simple oscillator and resonator analysis.</th>
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<td>Due</td>
<td>Weeks of October 3 and 10, in Lab</td>
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PRELAB 5 – ECEN 4634 (UNDERGRADUATE LAB)

1. Problem 2, Chapter 6 in lab notes, page 125.

2. Problem 5, Chapter 6 in lab notes, page 127.

3. Calculate the Q-factor of a X-band waveguide (WR-10) resonator with a TE101 mode (TE10 mode, \( \lambda_z/2 \) long in the third dimension), if the waveguide walls are coated with 10\( \mu \)m of gold so that they do not corrode. Standard WR-90 waveguide dimensions are 22.86 mm \( \times \) 10.16mm. How does the Q-factor change if the resonator length is increased to one wavelength?

ADDITIONAL PRELAB 5 – ECEN 5634 (GRADUATE LAB ONLY)

4. Problem 4, Chapter 6 in lab notes, page 127. Note that this problem requires the use of a SPICE based simulator (such as LTSPICE, PSPICE, OrCAD, etc) or other time-domain simulation tool.

5. Plot the loss of a 10-cm long X-band air-filled waveguide as a function of frequency over the waveguide band, assuming it is made of aluminum. Use the loss equation for the dominant TE10 mode (no need to do the general modes). If you see anything that surprises you, explain why it is unexpected, and then try to explain using physical reasoning.