Experiment No. 6
Transformer Principles
ECE 213

Peter Chinetti

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Instructor: Professor Shanechi

1 Introduction

A mutual inductance can be used to model two inductors which share a common magnetic path. This combination is a 'transformer'. Transformers are frequently used to convert a higher voltage to a lower voltage, such as in the power supplies of computers, or on the utility pole near houses. Transformers can also be used to convert a lower voltage to a higher voltage, such as in the electron gun in CRT monitors.

2 Background

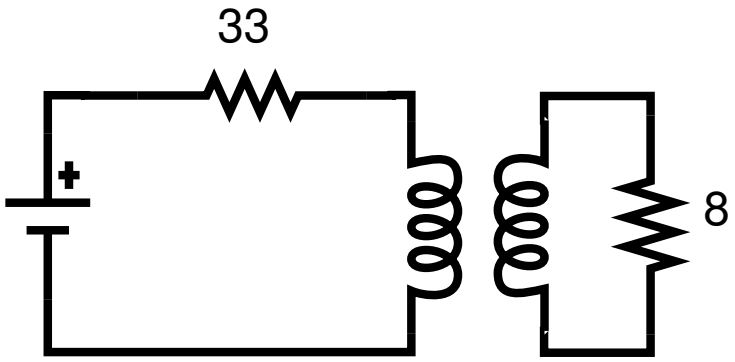

Figure 1: Lab Circuit

In the circuit in Figure 1, the resistance of from across the transformer is reflected back to the primary side according to the equation:

$$Z_{in} = \frac{Z_l}{n^2} \tag{1}$$

Therefore, the reflected impedance is 32Ω (Power across the the reflected impedance is .121 Watts). This is quite different than simply moving the 8Ω (Power across the series impedance is .076 Watts), 32Ω is much closer to the ideal resistance to transfer power to the 8Ω resistor.

3 Procedure

a. Calculate expected power

b. Build circuits

c. Test circuit

4 Equipment

- Oscilloscope
- Function generator

5 Data

Graphs of the measured voltages can be found in Figures 3-5. In these graphs, green is the input voltage, yellow is the output voltage (typically measured across the 8Ω. A table of measured V_{pp} values can be found in the table of Figure 6.

6 Conclusions

The purpose of this lab was achieved. A circuit was built with and a transformer to perform impedance matching. The measured power dissipated by the resistor close to doubled when the transformer was introduced.

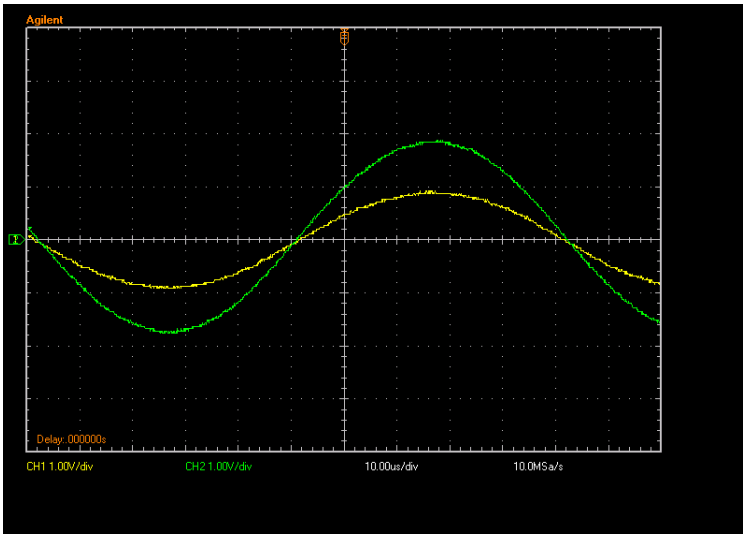

Figure 2: Unloaded Transformer

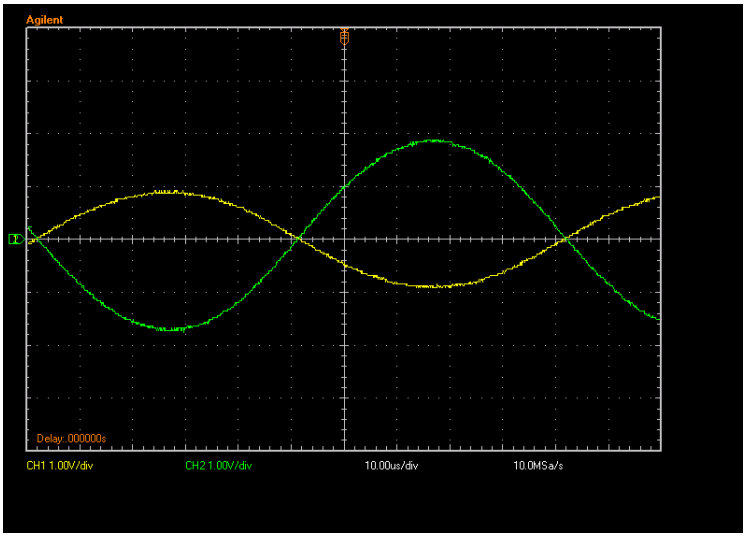

Figure 3: Unloaded Transformer With Flipped Outputs

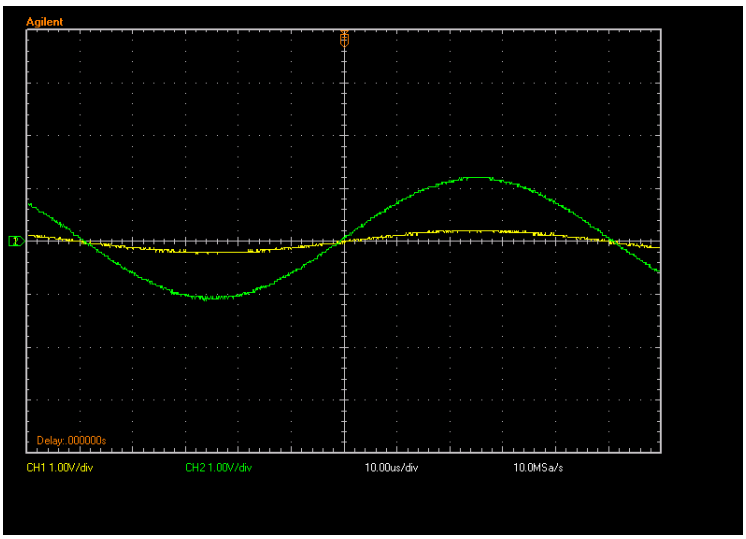

Figure 4: Voltage Divider

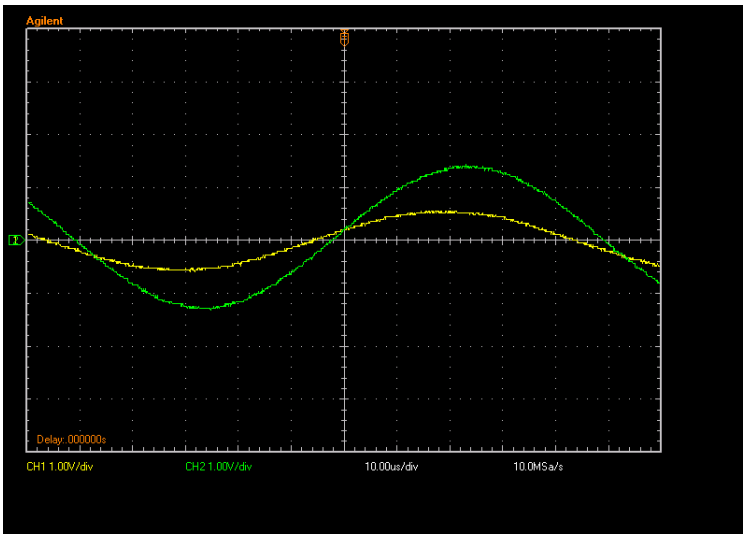

Figure 5: Reflected

Circuit	Input Voltage	Output Voltage	Power Dissipated in 8Ω Resistor
Unloaded	3.641	1.841	
Divider	3.261	.440	.0242
Transformer	2.721	.6	.045

Figure 6: V_{pp} Values