Lab1: Power in home appliances

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***Abstract*—This report presents the design and implementation of a security box and a dimmer circuit using DIACs and TRIACs. The reader also can find the validation review with the theoretical model seen in class.**

***Index Terms*—Error estacionario, Función de transferencia, Ganancia, Sistema de control**

I. INTRODUCTION

The main purpose of this practice is to perform an analysis on the wave form and measurements of three different type of load. Inside the security box there is a fuse to protect the equipment from any shortcut. We used a shunt resistor of 1 Ω and 10 W to measure current dividing the voltage by 1 to obtain the actual current value. All electronics devices are composed of resistances, capacitors and inductances, a soldering iron is a resistive linear load, they require heat to work. The voltage measured would be the same as the source but the current will vary depending on the power consumption of the device. We expect the same waveform for the voltage and current and no phase shift between them.

A drill would be an inductive linear load, based on the fact that motors are made of inductive coils. It should be a phase shift between voltage and current. The laptop is a nonlinear load, the voltage waveform would be the same but we expect a different shape for the current [1].

The second part consists on designing and developing an AC controller made of DIACs and TRIACs. This kind of circuit is able to change the RMS voltage on the terminals of a linear load by manipulating the firing angle of the TRIAC using a potentiometer. The load will not be linear anymore because of the electronic circuit resultant of the resistive load in series with the AC controller.

II. PROCEDURE

The purpose of this practice is to measure the power consumption on electrical home devices, such as a laptop, a drill and a soldering iron. Taking into account that they work with high values of voltage and current compared with previous labs, precautions were taken in order to protect the devices and our integrity. The Figure 1 shows the circuit proposed by the teacher to measure voltage and current safely.

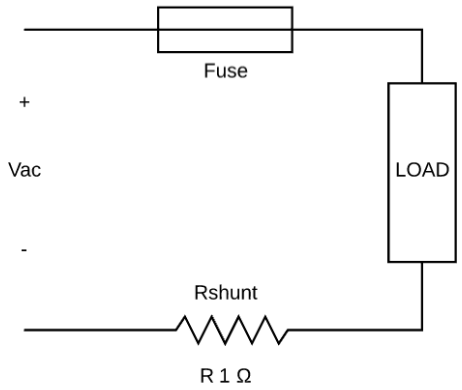

Fig. 1. Circuit Diagram.

V_{ac} represents the 120 Vrms sine wave obtained from the university phase line, *Fuse* represents a 3A circuit breaker, *Load* represents the load and *Rshunt* represents the 1 Ω and 10 W power resistor. We chose a small value for the resistor to do not affect the functioning of the circuit.

The circuit is inside a 4x4 box with a fuse holder to change the breaker, 4 measuring terminals; the white one for neutral, green one for ground and both black one for phase. The box is shown in the Figure 2.

For this practice we chose three different loads to analize their voltage and current waveform:

Fig. 2. Circuit box.

a soldering iron like resistive load, a drill like inductive load and a laptop like non-linear load.

In the following section are the results obtained in the practice:

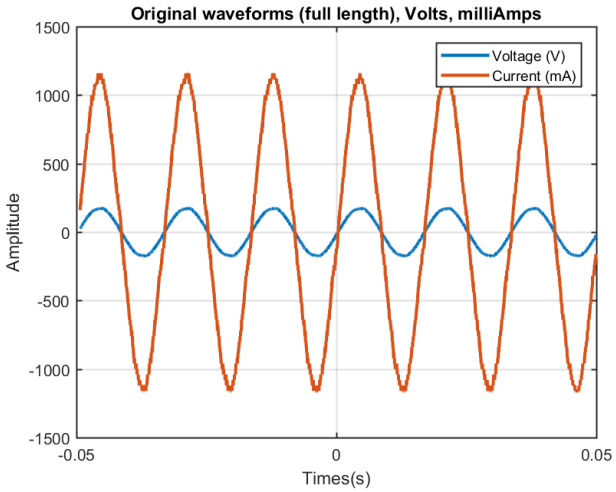

Fig. 3. Voltage and current waveforms of a resistive load.

1) Solderin Iron (resistive):
2) Drill (inductive):
3) Laptop (non-linear):

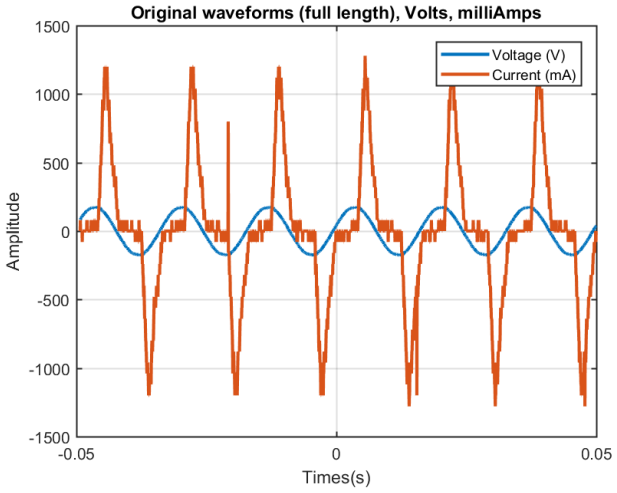

Fig. 4. Voltage and current waveforms of a inductive load.

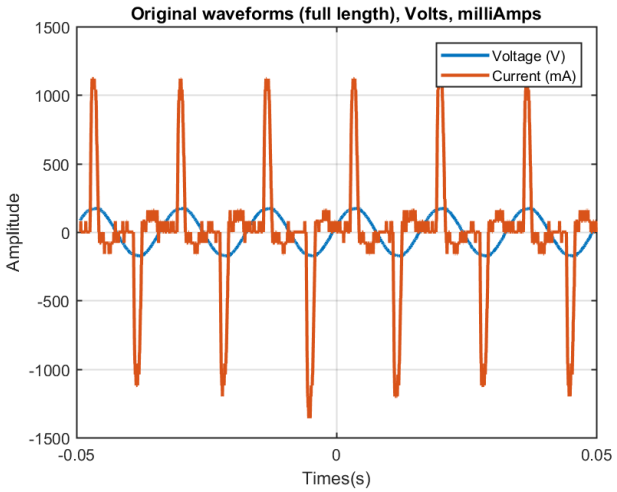

Fig. 5. Voltage and current waveforms of a non-linear load.