AC Circuits: Lab 1

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Procedure

Apparatus

Results

a) AC circuit with a single resistor

Measurements

$$\Delta V_{\max} = 4.0V \pm 0.2V \tag{1}$$
$$\Delta V_{rms} = 2.79V \pm 0.06V \tag{2}$$
$$I_{rms} = 4.0V \pm 0.2V \tag{3}$$
$$T = 1.00ms \pm 0.04ms \tag{4}$$

Calculations

$$\Delta V_{rms} = \frac{\Delta V_{\max}}{\sqrt{2}}$$
$$\Delta V_{rms} = \frac{4.0V \pm 0.2V}{\sqrt{2}}$$
$$\Delta V_{rms} = 2.8V \pm 0.1V \tag{5}$$

$$P_{avg} = \Delta V_{rms} I_{rms}$$
$$P_{avg} = 2.79V \pm 0.06V * 4.0V \pm 0.2V$$
$$P_{avg} = 0.285W \pm 0.012W \tag{6}$$

$$F = \frac{1}{T}$$
$$F = \frac{1}{0.001s \pm 0.0004s}$$
$$F = 1000Hz \pm 40Hz \tag{7}$$

Discussion

The voltage$_{rms}$ measured at (2) agrees with the calculated value at (5)

The frequency calculated at (7) agrees with the given value of 1000 Hz

When the frequency was set to 100Hz, a time scale of 2ms/div was needed for proper observation

When the frequency was set to 10Hz, a time scale of 20ms/div was needed for proper observation. The sine wave shown on the oscilloscope also started flashing

Since this is an ac circuit, the lamp should flash twice per period. Thus, by setting the frequency to 1 Hz should make the lamp light up 20 times over 10 seconds. This was confirmed when tested, and the lamp does flash twice per period because there is two voltage peaks during one period.

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b) AC circuit with an inductor

Measurements

$$\Delta V_{L\,\text{max}} = 4.0\text{V} \pm 0.2\text{V} \tag{8}$$

$$\Delta V_{Lrms} = 2.79\text{V} \pm 0.06\text{V} \tag{9}$$

$$I_{rms} = 4.0\text{V} \pm 0.2\text{V} \tag{10}$$

$$T = 1.00\text{ms} \pm 0.04\text{ms} \tag{11}$$