

## The Magnetic Field of a Long, Straight Wire

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

### Part 1 - Data

**CHECKPOINT 1:** Ask your TA to check your circuit connections.

What is the thickness of one piece of Styrofoam?

What is the current flowing in the wire?

Complete the table below.

**Data Table 1**

Distance $r$ (m)	Deflection $\theta$ (deg)	$B_{\text{wire}}$ (T)	$\ln B$	$\ln r$

**CHECKPOINT 2:** Ask your TA to check your values before proceeding.

What is the slope of the plot of  $\ln B$  versus  $\ln r$ ?

What is the intercept of the plot of  $\ln B$  versus  $\ln r$ ?

## Part 2 - Calculations

What is the value of  $n$  calculated from the slope?

The formula for uncertainty in  $\mu_0$  is

$$\sigma_{\mu_0} = \mu_0 \sqrt{\left(\frac{\sigma_I}{I}\right)^2 + \left(\frac{\sigma_K}{K}\right)^2}.$$

Define the intercept of the graph as  $b$ , then  $K = e^b$  and  $\sigma_K = \sigma_b K$ . What is the value of  $\mu_0$  determined from the intercept of the graph of  $\ln B$  versus  $\ln r$ ?

What is the percent error between the experimental value of  $\mu_0$  and the accepted value?

**CHECKPOINT 3:** Ask your TA to check your Excel graph and calculations.