Estimating the Focal Length of a Thin Lens

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1 Objective

I was given some lenses from a manufacturer, who stated that the focal length of the lens was exactly 15 cm with no given uncertainty. Put simply, I want to check this number. The process for measuring the focal length utilized simple, inexpensive lab equipment.

2 Setup & Theory

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \implies f = \left(\frac{1}{f}\right)^{-1} \tag{1}$$

where:

d_o is the distance from the lens to the object,

d_i is the distance from the lens to the image

I mounted a light which projected an image through my lens and onto a flat plate. I adjusted v_o and v_i until the image was in focus on the plate.

3 Results

h_o (cm)	h_i (cm)	d_o (cm)	d_i (cm)
1.55 ± 0.05	2.15 ± 0.05	30 ± 0.05	38.24 ± 0.05
1.55 ± 0.05	1.5 ± 0.05	32.4 ± 0.05	35 ± 0.05
1.55 ± 0.05	1.1 ± 0.05	28.7 ± 0.05	40 ± 0.05
1.55 ± 0.05	1.9 ± 0.05	32 ± 0.05	35.7 ± 0.05
1.55 ± 0.05	1.3 ± 0.05	37 ± 0.05	30.8 ± 0.05
1.55 ± 0.05	1.9 ± 0.05	31 ± 0.05	36.75 ± 0.05
1.55 ± 0.05	1.67 ± 0.05	33 ± 0.05	34.4 ± 0.05

Table 1: Measured Data

v (cm)	u (cm)
16.90	
16.82	
16.70	
16.87	
16.81	
16.82	
16.84	

Table 2: Results

UNCERTAINTY SOURCES

4 Discussion