جامعة بيرزيت

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# Phys111 Report

8.5

**Experiment #5: Focal Length of a Convex Lens**

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|---|---|---|---|
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## (1) Abstract:

- **Aim of the experiment:**

To find the focal length of a lens.

- **The main result is:**
  - The focal length of the convex lens is $f = (9.5 \pm 0.1)$ cm

## (2) Data:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $u\ (cm)$ | 40 | 45 | 55 | 65 | 75 | 90 |
| $v\ (cm)$ | 11,5 | 11,2 | 10,9 | 10,4 | 10,1 | 9,9 |
| $1/u\ (cm)^{-1}$ | 0,025 | 0,022 | 0,018 | 0,015 | 0,013 | 0,011 |
| $1/v\ (cm)^{-1}$ | 0,087 | 0,089 | 0,091 | 0,096 | 0,099 | 0,101 |

| | | |
|---|---|---|
| $\Delta u \approx 0,16$ cm | $\Delta v \approx 0,16$ cm | $f_{true} \approx 11,3$ cm |

## (3)Calculations:

$\bar{u} = 61.67\,cm$ $\bar{v} = 10.67\,cm$ $\overline{\left(\frac{1}{u}\right)} = 0.017\,cm^{-1}$ $\overline{\left(\frac{1}{v}\right)} = 0.094\,cm^{-1}$

$f_1 = x_{intercept} = \frac{1}{0.097} = 10.3\,cm$ $f_2 = y_{intercept} = \frac{1}{0.115} = 8.7\,cm$

$\bar{f} = \frac{f_1 + f_2}{2} = 9.5\,cm$

$\Delta\bar{f} = \bar{f}^2\left(\frac{\Delta u}{\bar{u}^2} + \frac{\Delta v}{\bar{v}^2}\right) = (9.5)^2\left(\frac{0.16}{(61.67)^2} + \frac{0.16}{(10.67)^2}\right) = 0.13\,cm$

## (4)Results:

- The focal length of the convex lens is $f = (9.5 \pm 0.1)\,cm$

## (5)Conclusions:

After finished the experiment and taking measurements, we go to discrepancy test → $|f_{true} - f_{exp}| \leq 2 * error$

$|11.3 - 9.5| \leq 2 * 0.1$ → $1.8 \not\leq 0.2$ ✗

The condition doesn't met, so the result not accepted.

Possible causes of errors :-

1- Lighting: The light source in the Lab should be the only one hitting the lens for accurate measurements.

2- Graphing: A large scale was used to plotting the points (x)and(y) So the values were estimated instead of being measured accurately

And some possible reasons are that the ruler is not perfectly straight and lens base is not stable.

Presented