Determination of focusing power of the lenses by using an optical bench

Focusing power *Z* depends on the radius of curvature and the relative refraction coefficient.

$$Z = \frac{1}{f} = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

Determination of a focusing power based on lens equation.

$$\frac{1}{f} = \frac{1}{x} + \frac{1}{y}$$

A **Converging lens**

1. Place the object at the end of the optical bench opposite to the screen. Attach the focusing lens between the object and the screen.
2. Shift the lens along the bench until the image looks as sharp as possible.
3. Measure the object distance (x) and the image distance (y).
4. Repeat the measurements (teacher determines the amount of repetitions), each time for difference positions of the object and the lens.
5. For each measurement, calculate focusing power Z_c and next the mean value $\overline{Z_c}$.
6. Type the results in the table.

Lp	*x* [m]	*y* [m]	1/*x* [m^{-1}]	1/*y* [m^{-1}]	Z_c [D]	$\overline{Z_c}$ [D]
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

B **Diverging lens**

Diverging lenses give virtual images, which one cannot see. In order to determine focusing power of diverging lens, one must create system of two adjacent lenses: converging lens (known focal distance) and diverging lens. For such a system, focusing ability is a necessary condition.

The focusing power Z_s of system equals to sum of the focusing powers Z_1 i Z_2:

$$Z_s = Z_1 + Z_2$$

In this case:

$$Z_s = Z_c + Z_d$$

Using optical bench, determine focusing power of system Z_s.

1 Place the object at the end of the optical bench opposite to the screen. Attach the lens system between the object and the screen.
2 Shift the lens system along the bench until the image looks as sharp as possible.
3 Measure the object distance (x_s) and the image distance (y_s).
4 Repeat the measurements (teacher determines the amount of repetitions), each time for difference positions of the object and the lens system.
5 For each measurement, calculate focusing power of system lens Z_s and next the mean value ($\overline{Z_s}$).
6 By using the above formula, calculate the mean value of focusing power of diverging lens ($\overline{Z_d}$). Note, that one must use the mean value $\overline{Z_c}$ from the previous section.
7 Type the results in the table.

Lp	x_s [m]	y_s [m]	$1/x_s$ [m^{-1}]	$1/y_s$ [m^{-1}]	Z_s [D]	$\overline{Z_s}$ [D]	$\overline{Z_d}$ [D]
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Issues

Fundamentals of geometrical optics:

- Refraction of light phenomena
- Lens' types
- Light crossing through the lens (lens equations and image types)

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