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 Shift the lens along the bench until the image looks as sharp as possible.
2 Measure the object distance (x) and the image distance (y) in reference to lens.
3 Repeat the measurements (teacher determines the amount of repetitions), each time for difference positions of the object and the lens.
4 For each measurement, calculate focusing power Z_c and next the mean value $\overline{Z_c}$.
5 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 Shift the lens system along the bench until the image looks as lightest as possible.
2 Measure the object distance (x_s) and the image distance (y_s).
3 Repeat the measurements (teacher determines the amount of repetitions), each time for difference positions of the object and the lens system.
4 For each measurement, calculate focusing power of system lens Z_s and next the mean value ($\overline{Z_s}$).
5 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.
6 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
- Lenses' types
- Light crossing through the lens (lens equations and image types)

Eye construction and its function.
Vision defects and its corrections.

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