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**Exploring the world of optical devices: Telescope**

1. **Keplerian telescope**

Measure the focal length of lens 1 (objective) and lens 2 (eyepiece).

Fill in the table. Using the schematic construct the Keplerian version of the telescope and observe faraway objects.

|  |  |
| --- | --- |
| Focal length (f1), cm | 30 |
| Focal length (f2), cm | 5 |
| Distance between lenses (calculated), cm | 35 |
| Distance between lenses (measured), cm | 34 |
| Predicted magnification, M = f1/f2 | 6 |
| Image: straight/inverted | inverted |
| Field of view: narrow/wide | wide |



Figure 1. Schematic of Keplerian telescope.

1. **Galileo’s telescope**

Here we are going to change the second convex lens (eyepiece) by a concave one.

Fill in the table. Using the schematic construct the Galileo’s version of the telescope and observe faraway objects.

|  |  |
| --- | --- |
| Focal length (f1), cm | 30 |
| Focal length (f3), cm | 5 |
| Distance between lenses (calculated), cm | 25 |
| Distance between lenses (measured), cm | 23 |
| Predicted magnification, M = f1/|f3| | 6 |
| Image: pright/inverted | upright |
| Field of view: narrow/wide | narrow |



Figure 2. Schematic of Galileo’s telescope.

1. **Conclusion (compare two types of the telescopes).**

Telescope is a device designed for magnification of faraway objects (like stars, planets). In this class we have covered two simple types of telescopes originally build by astronomers Johannes Kepler and Galileo Galilei in the beginning of XVII century. Both telescopes consist of two lenses. The difference is that in Kepler’s case both lenses are convex, while in Galileo’s objective is convex, eyepiece is concave. Galileo’s telescope produces direct image, however field of view is quite narrow. In comparison, image obtained with Keplerian telescope is inverted and field of view is much wider. The magnification of available telescopes equals to the ratio of foci, which is 6 for both telescopes.