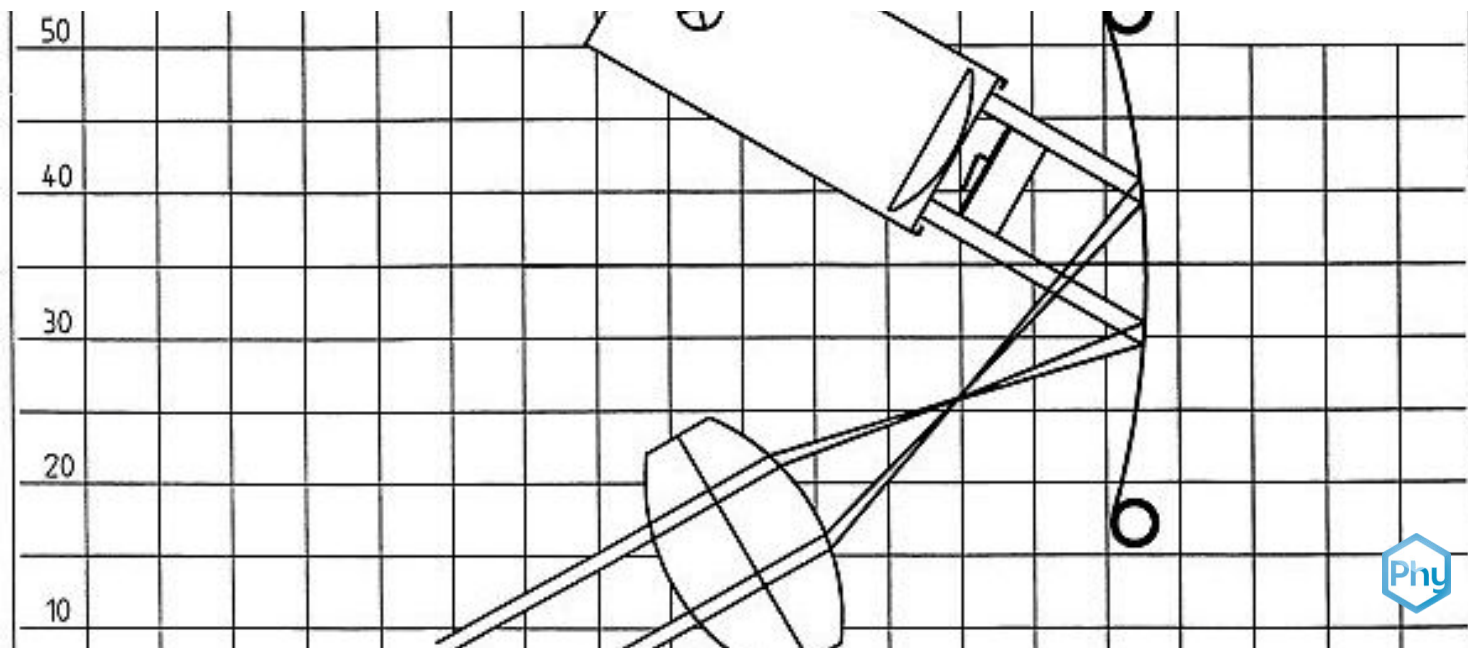


Herschel's reflecting telescope



The reflecting telescope according to Herschel

Physics

Light & Optics

Optical devices & lenses



Difficulty level

easy



Group size

-



Preparation time

10 minutes



Execution time

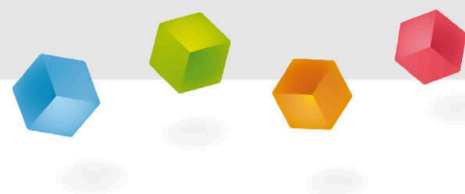
10 minutes

This content can also be found online at:



<http://localhost:1337/c/64725726e1994e000281c7cd>

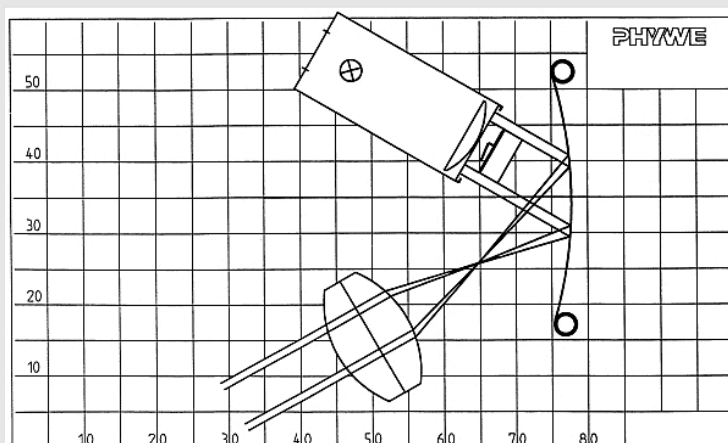
PHYWE



Teacher information

Application

PHYWE



Experimental set-up:

Beam with aperture and mirror

In this experiment, the construction of a reflecting telescope according to Herschel is to be explained.

In the Herschel telescope, the object rays are deflected with the help of a concave mirror and then focused with an eyepiece.

Other teacher information (1/2)

PHYWE

Prior knowledge



Students need prior knowledge of imaging optics, with collecting and diverging lenses and the spectral colours of light.

Principle



It will be demonstrated how a reflecting telescope is constructed, according to Herschel, in principle and how the beam path is in it.

Other teacher information (2/2)

PHYWE

Learning objective



Students should understand the application of different lenses in technical developments.

Tasks



The students should make observations and gather knowledge about the experimental set-up.

Safety instructions

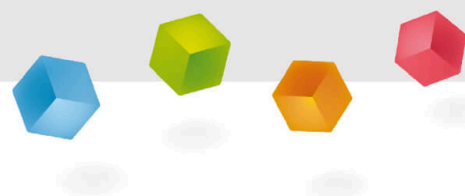
PHYWE



- The general instructions for safe experimentation in science lessons apply to this experiment.

PHYWE

Student information



Motivation

PHYWE



Reflecting telescope in Herschel design

The Herschel reflecting telescope is similar to the Newtonian reflecting telescope, but this design does not have a plane mirror for deflection.

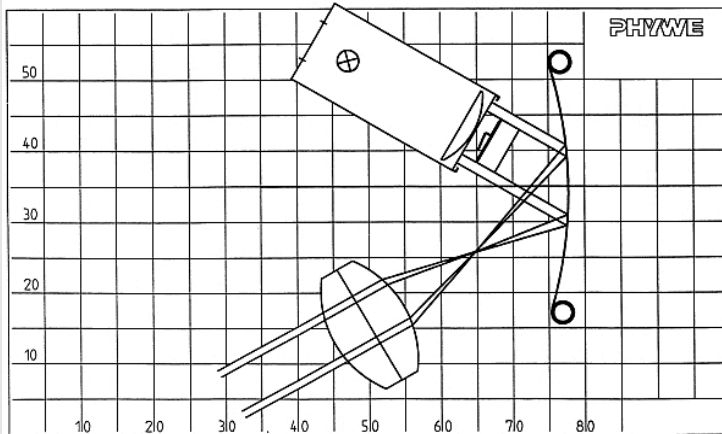
The underlying experiment is intended to show exactly how it is constructed.

Equipment

Position	Material	Item No.	Quantity
1	PHYWE Demo Physics board with stand	02150-00	1
2	Halogen lamp for experiments, 12V/50W, with magnetic base	08270-20	1
3	Opt. block, planoconvex, magn.held	08270-02	2
4	Diaphragm w. holder, magnet held	08270-10	1
5	Concave/convex mirror, magnet held	08270-12	1
6	PHYWE Multitap transformer DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
7	G-clamp	02014-01	2

Set-up and Procedure (1/2)

PHYWE

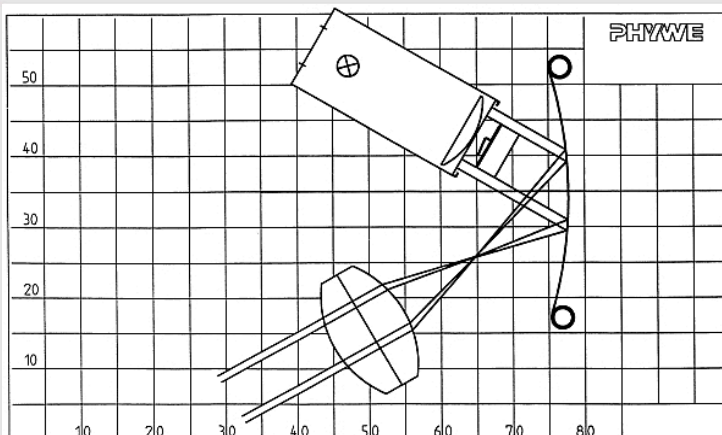


Beam with concave mirror and biconvex lens

- Set optical axis on adhesive panel
- Draw an arc of a circle ($r = 600 \text{ mm}$) with the compass.
- Position the lamp with the 5-slit aperture so that the centre beam is on the optical axis.
- Dim the three middle beams using the diaphragm with holder.
- Attach concave mirror to circular arc and adjust; focal length approx. 300 mm

Set-up and Procedure (2/2)

PHYWE

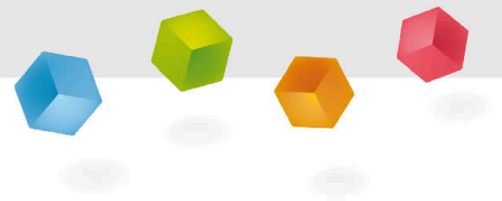


Beam with concave mirror and biconvex lens

- Move the lamp with the diaphragm so that the two beams form a favourable angle with the optical axis and strike the mirror at the same distance from it.
- Remove the 5-slit diaphragm from the luminaire so that two wider light beams hit the mirror.
- Place biconvex lens so that the rays leave it parallel
- View beam path

PHYWE

Report



Task 1

PHYWE

Put the correct words into the gaps!

The almost [] rays emanating from a distant object are [] by the [], which has a low curvature, so that they intersect in its []. The resulting image of the object can be viewed through a [] (eyepiece) attached to the side.

collecting lens

cavity mirror

reflected

parallel

focal plane

☒ Check

Task 2

PHYWE

The Herschel telescope and the Newtonian telescope differ only in their names.

☐ True☐ False   Review

With a telescope, objects can be magnified as desired.

☐ True☐ False   Review

Slide

Score / Total

Slide 12: Eyepiece

0/5

Slide 13: Multiple tasks

0/2

Total

  0/7 Solutions Repeat