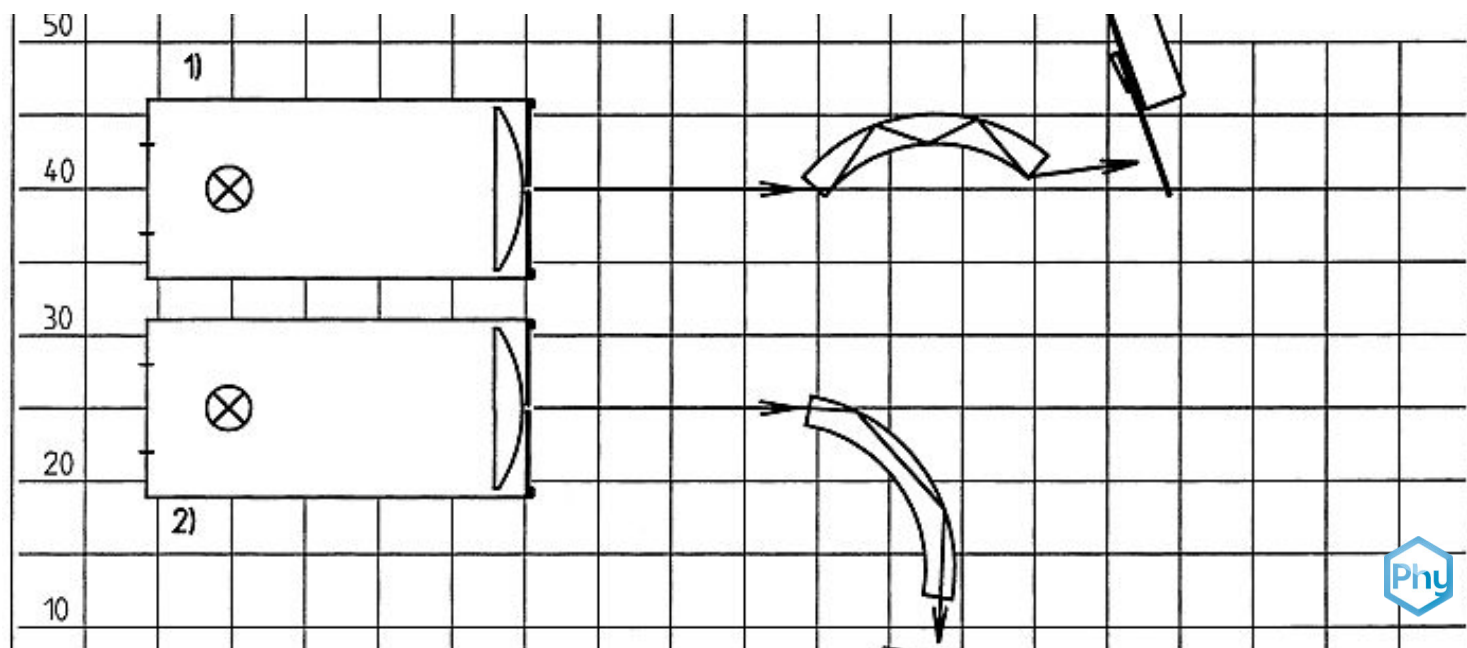


Light transmission by total reflection



Physics

Light & Optics

Reflection & refraction of light



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/6460cbf8e77b7c0002339b82>

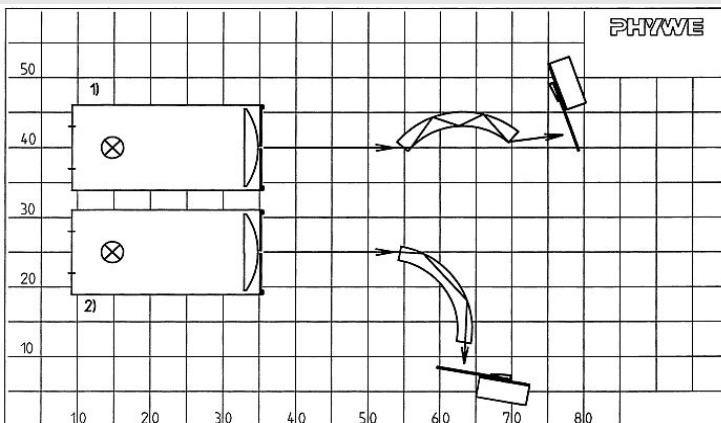
PHYWE



Teacher information

Application

PHYWE



Experimental set-up:

Beam path with light guide model

Light guides function similarly to prisms.

Through an outer screen, the light also travels around curves in the direction of the conductor.

It is currently the fastest option for wired data transmission.

Other teacher information (1/2)

PHYWE

Prior knowledge



Students need prior theoretical knowledge about the straight-line, ray-shaped propagation of light. They should have previous knowledge of light refraction and refractive indices.

Principle



The principle of transmitting light signals through light guides is to be demonstrated in a model experiment.

Other teacher information (2/2)

PHYWE

Learning objective



The students should observe how a light guide can be used and how the light travels in it.

Tasks



The students should observe the experiment and understand how light guides work.

Safety instructions

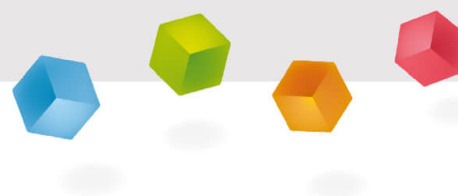
PHYWE



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

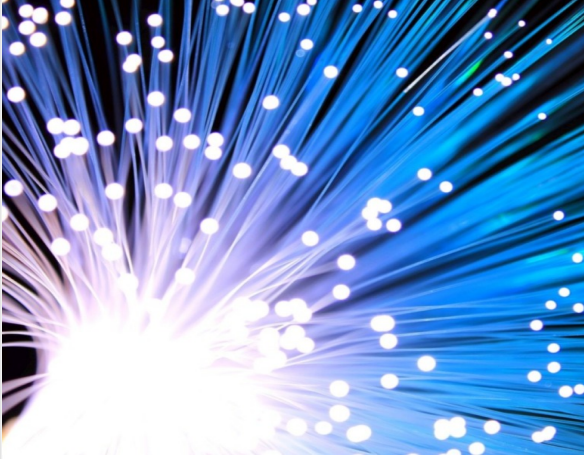
PHYWE

Student information



Motivation

PHYWE



Luminous optical fibres

The picture on the left shows a relic of the 20th century. With the help of these illuminated fibre tufts, concert and festival-goers used to create the right atmosphere when the stage lights failed.

Today, a similar technology is used for the distribution of wired internet, so-called fibre optic lines are used for the fast transport of data.

But how is it actually possible to "send" light over long distances underground and in curves?

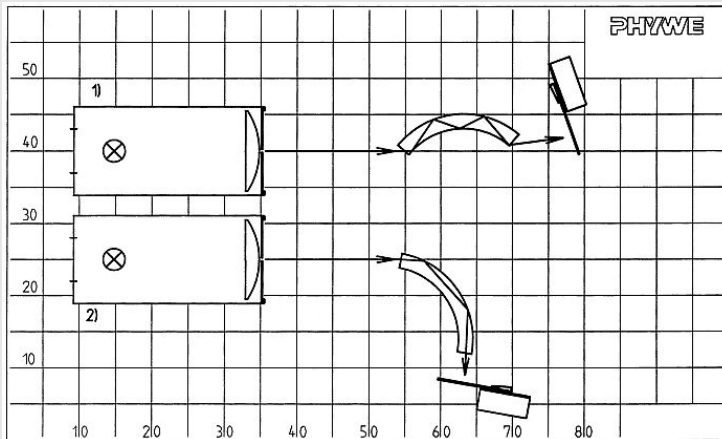
Today's experiment is intended to provide some initial insights into this.

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	Light guide model, magnet held	08270-11	1
4	Diaphragm w. holder, magnet held	08270-10	1
5	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
6	G-clamp	02014-01	2

Set-up and Procedure

PHYWE

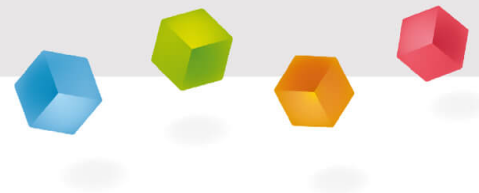


1-slit aperture directed towards optical conductors

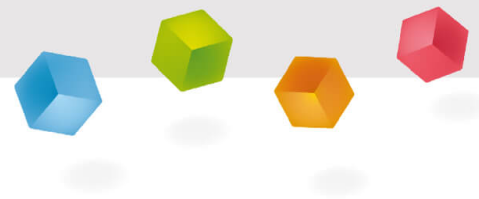
- Place the 1-slit luminaire on the adhesive panel
- Bringing the light guide model into the beam path
- Vary the angle of incidence of the light beam by rotating the light guide model
- Observing ray trajectories in the light guide model
- Trace the light beam emerging from the light guide model using an aperture holder with white cardboard or paper.

PHYWE

Report



PHYWE



Report

Task 1

PHYWE

Put the correct words into the gaps!

In a , light is by it off the outer walls like in a prism.

reflecting

time

The high at which light makes it possible to send large amounts of data in the shortest .

propagates

light guide

transported

speed

☒ Check

Task 2

PHYWE



The light beam in the light guide model is

reflected twice.

reflected once .

reflected with varying frequency, depending on the angle of incidence.

Task 3

PHYWE

Light signals can be transmitted over long distances through light guides.

Light guides are a technical application of semiconductor refraction.

☐ True☐ False☒ Check

If the light is reflected several times in the light guide, the emerging light beam is generally only faintly visible on the panel. In contrast, the light spot on a flat surface held perpendicular to the panel is always clearly visible.

☐ True☐ False☒ Check