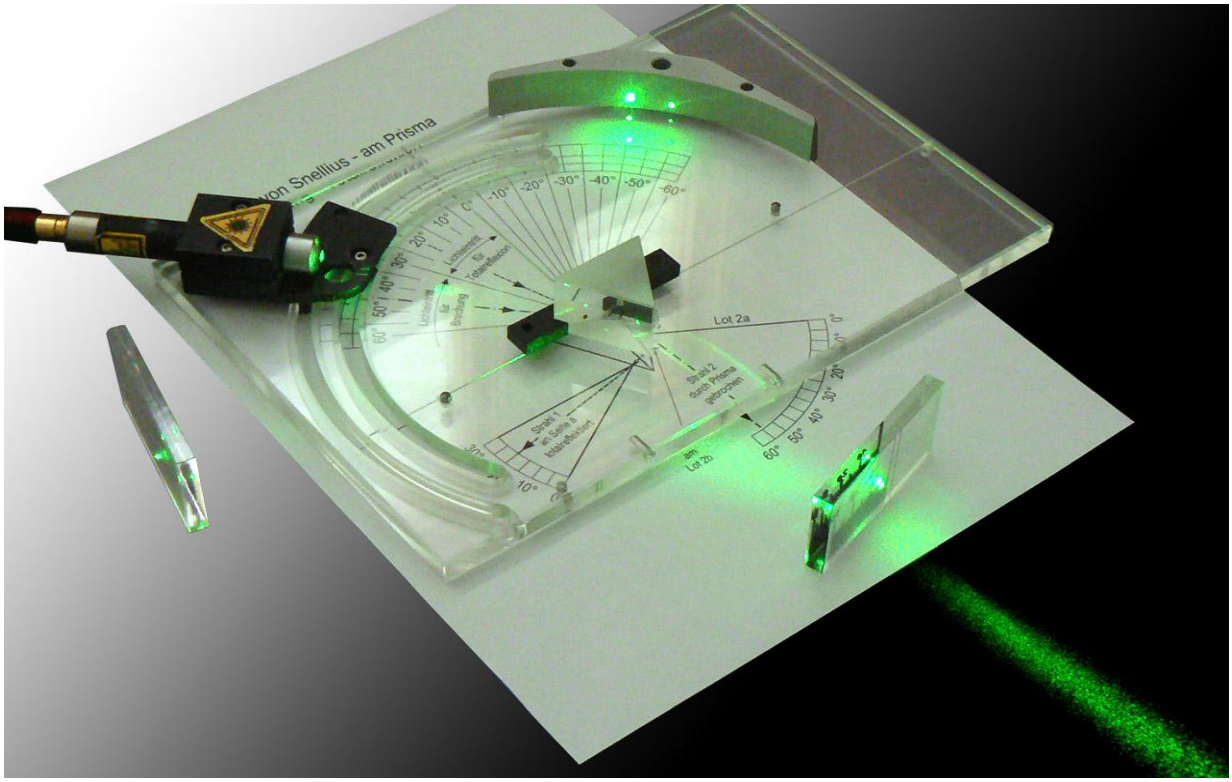
campus®

CA-2100 Optics Kit Refraction/Reflection



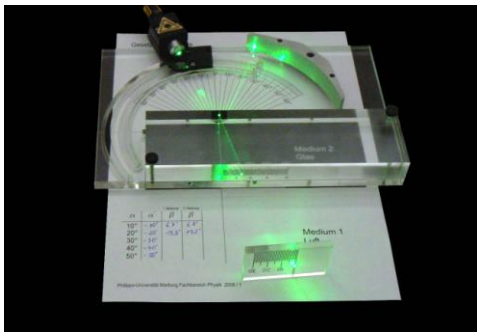
Photonics is the science of generating, controlling, and detecting photons. While the 20th century was the century of the electron, the 21st century seems to become the century of the photon. To be well prepared for this new era miCos offers an optics kit for the basics in refraction and reflection. The kit is addressed to first year physics courses as well as classes of optics in colleges. Using a laser as photon source and transparent materials in combination with well elaborated templates a new didactic approach to the classical optics laws is given.

Educational Objectives:

- Refraction and reflection at glass
- Refraction and reflection at water
- Optical path in a medium
- Transition glass – water
- Parallel translation
- Total internal reflection
- Refraction and reflection in a prism
- Ray tracing in lenses and prisms

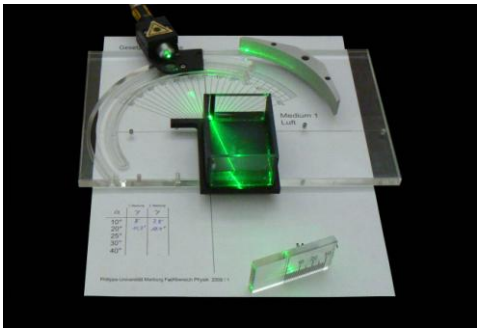
Set-Up and Components

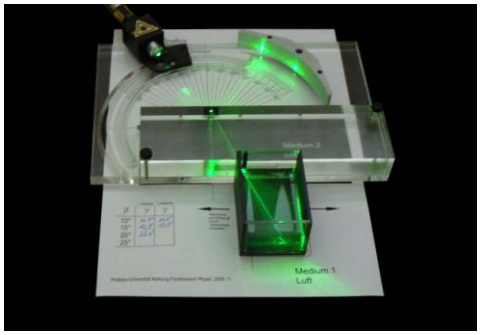
The Optics Kit allows the following types of experiments:



Refraction on a plane acrylic glass slab is investigated. Mounted on a goniometer slide a green laser can be continuously pivoted. Different angles of incident, reflected and refracted beams are adjusted and measured. In this way the Law of Reflection the Law of Snellius are verified. The keen laser beam can be followed in air as well as within the material by scattering. The measured angles are noted directly on the template, as well as the beam traces are drawn in.

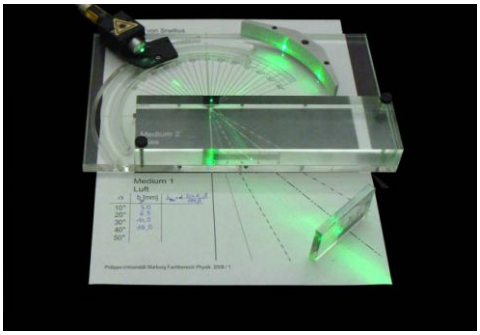
The similarities and differences of refraction on solids and liquids are demonstrated. Refraction of a light beam when entering a tray of water is investigated. The refractive index of water is calculated.

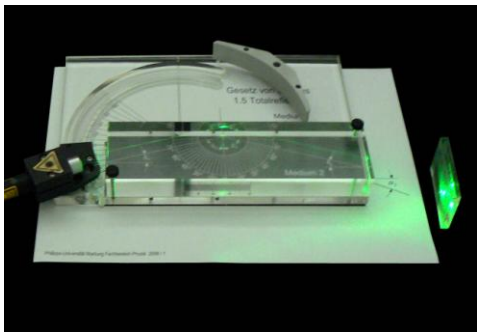




The acrylic slab and the water tray can be combined. The beam transition from an optically dense (acrylic glass) to an optically lighter (water) medium is investigated. From the measured angles the ratio of the refractive indices is calculated and compared to the values from previous measurements.

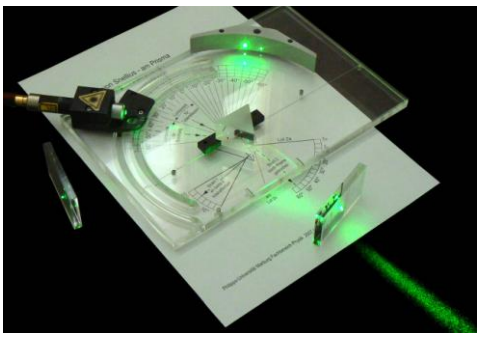
A light beam is parallely translated when passing a transparent slab. This shift is measured as a function of several incident beam's angles and verified by calculation.

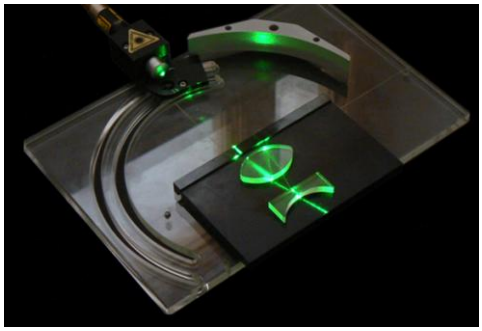




Shining sideways in the acrylic slab a laser beam experiences the total internal reflection. Angles of refracted and reflected beams are measured and noted. A ray trace of the totally reflected beam is drawn.

In case of installing an equilateral prism two types of beam traces can be reproduced and measured: depending on the angle of incidence total internal reflection or refraction of the beam is observed.





Placed on a slide some 2D objects like lenses or prisms can be investigated. The optical path formed by a single lens or a pair of lenses can be visualized. The use of prisms for refraction as well as reflection is demonstrated. By moving the slide the continuous change of the optical path can be followed.

The Optics Kit contains:

1 Optics base plate with projection wall
2 Laser module (1mW) on goniometer mount
3 Refraction cuboid with scale
4 Transmission trough for liquids
5 3D Refraction prism 60°
6 Sliding platform with 2D elements: 90° Prism, 40° Prism, biconvex, plano convex, and biconcave lens
7 Screen with scale
8 Templates for the following experiments (printed and pdf):
    - Refraction air – glass
    - Refraction air – water
    - Refraction glass – water
    - Parallel translation
    - Total internal reflection
    - Optical paths in prism
9 User manual

Version 1/09