Refraction at the air-glass boundary

Principle and equipment

Principle

Demonstrate how a beam of light travels when it passes from air into glass and visa versa.

Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	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
3	Lamp,halogen,mag.held,12V/50W	08270-20	1
4	Light box 12V/20W,w.magn.base	09804-00	1
5	Opt. block,trapeze, magnet held	08270-05	1
Additional material:			
	Ruler		
	Water-soluble white board pen		
	Protractor		

Robert-Bosch-Breite 10
D - 37079 Göttingen
Tel: +49 551 604 - 0
Fax: +49 551 604 - 107
info@phywe.de
www.phywe.com

Set-up and procedure

- Draw a horizontal line to mark the boundary about in the middle of the lower half of the magnet optics panel.
- Set up the axis of incidence (normal line).
- Position the trapezoidal optical block according to Fig. 1. Place the magnet-held lamp with a one-slit diaphragm so that the beam travels toward the axis of incidence and is not refracted ($\alpha = \beta = 0^\circ$). If necessary re-position of the optical block.
- Change the angle of incidence and observe the path of the light beam while doing so. (Fig. 1).
- Then position the light box with a one-slit diaphragm so that the light beam travels in a direction exactly opposite to that of the magnet-held lamp (Fig. 2).
- Alternately switch the light box and the magnet-held lamp on and off.

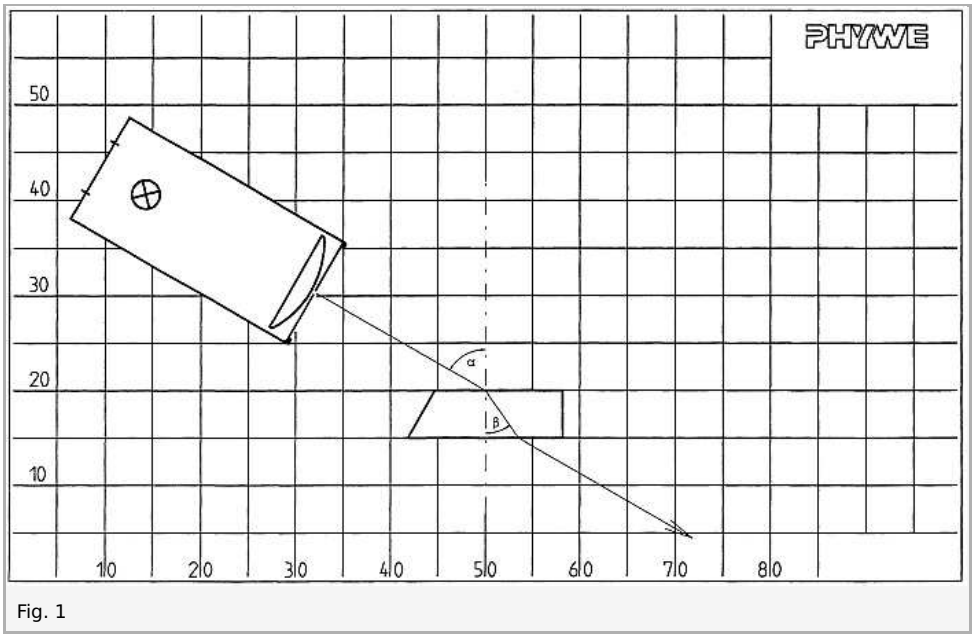

Fig. 1

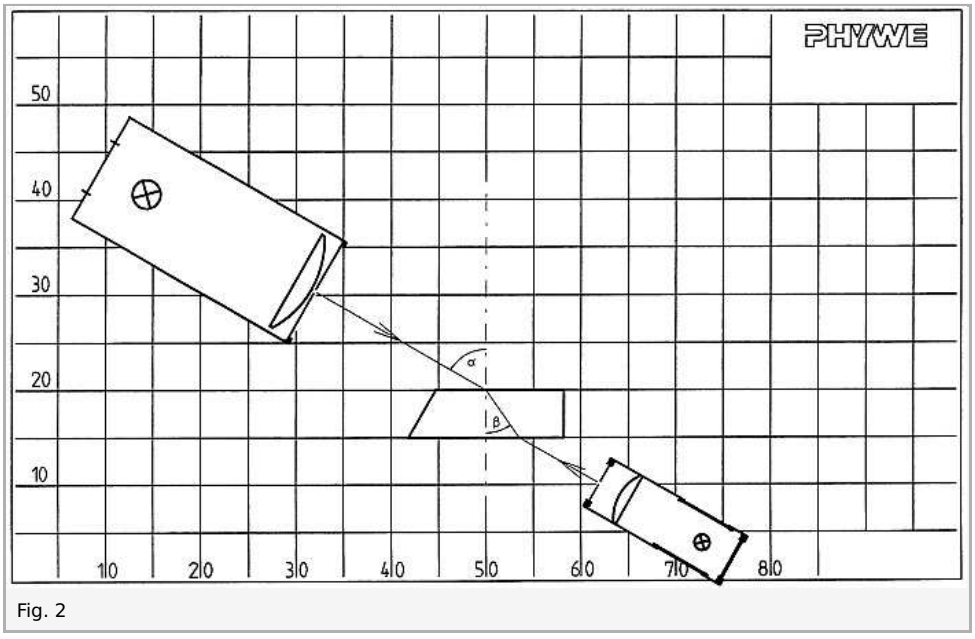

Fig. 2

Observation and evaluation

When the light beam passes from air into glass at an angle, its direction changes: it is refracted. The angle of incidence is always larger than the angle of refraction: the beam is refracted toward the perpendicular.
If the light beam passes from glass into air, it is refracted away from the perpendicular. Incident beam, refracted beam and axis of incidence lie in the same plane.
If the angle of incidence is 0°, the light beam is not refracted. Part of the light is reflected at the boundary surface. The light path is reversible.

Remark
If one desires to determine the difference in refraction at the air-glass and air-water boundary, it is advisable to determine and note pairs of values for the angles of incidence and refraction. The location on which the light beam leaves the glass and enters the air is marked, the incident beam is drawn as completely as possible, the optical block removed and the light paths completed, and the angles α and β measured (e.g. for $\alpha = 45^\circ$ $\beta = 28^\circ$; cf. Fig. 3).

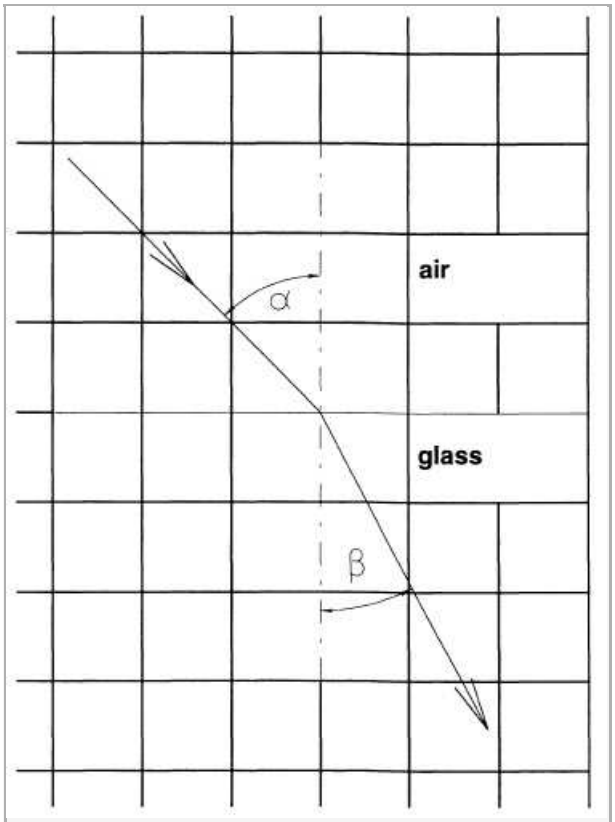

Fig. 3