Universität Leipzig, Fakultät für Physik und Geowissenschaften

Exercises for Experimental Physics 3 – IPSP

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Exercise Sheet 7 (WS 2012/13)

Date of Issue to Students: Nov. 23^{th} 2012

Date of Submission: Nov. 30^{th} 2012

Submission Place: Marked mailbox next to room 302 (Linnestr. 5)
Submission Time: 11:00 a.m. at the submission day noted above

Please note: Write your name and matriculation number on EACH sheet of paper.
Only submit the calculations and results for exercise 1-3, exercise 4 will be discussed during the instruction classes.

Exercises:

1. The index of refraction for silicate flint glass is 1.66 for violet light that has a wavelength in air equal to 400 nm and 1.61 for red light that has a wavelength in air equal to 700 nm. A ray of 700-nm-wavelength red light and a ray of 400-nm-wavelength violet light both have angles of refraction equal to 30° upon entering the glass from air. What is the difference between the angles of incidence of the two rays? (6 Points)
2. Figure 1 shows a beam of light incident on a glass plate of thickness d and index of refraction n. (a) Find the angle of incidence so that the separation b between the ray reflected from the top surface and the ray reflected from the bottom surface and exiting the top surface is a maximum. (b) What is this angle of incidence if the index of refraction of the glass is 1.60? (c) What is the separation of the two beams if the thickness of the glass plate is 4.0 cm? Draw a sketch! (10 Points)
3. Show mathematically that a linearly polarized wave can be thought of as a superposition of a right and a left circularly polarized wave. (4 Points)
4. A laser beam is incident on a plate of glass that is 3.0-cm thick (Figure 1). The glass has an index of refraction of 1.5 and the angle of incidence is 40°. The top and bottom surfaces of the glass are parallel. What is the distance b between the beam formed by reflection off the top surface of the glass and the beam reflected off the bottom surface of the glass?

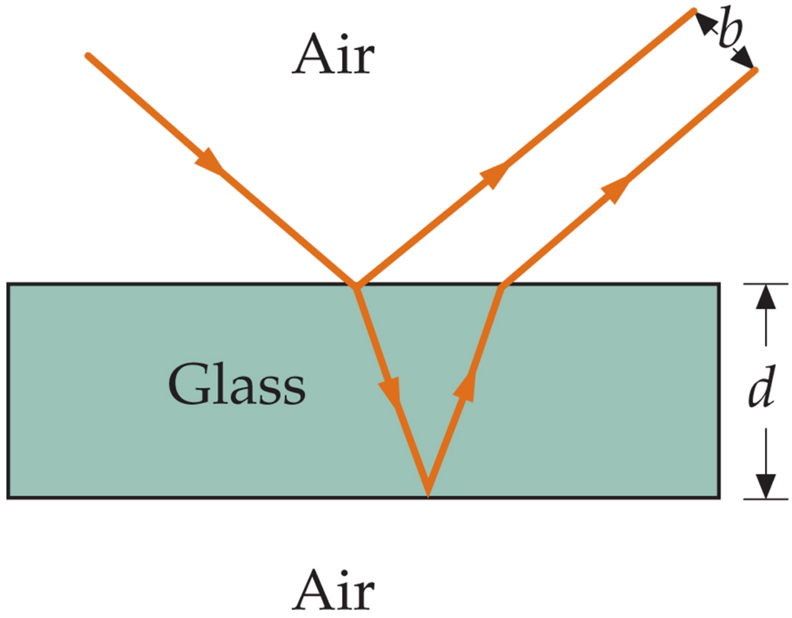

Figure 1: Exercise 2 and 4