Universität Leipzig, Fakultät für Physik und Geowissenschaften

Exercises for Experimental Physics 3 – IPSP

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Exercise Sheet 12 (WS 2010/11)

Date of Issue to Students: Jan. 20^{th} 2010

Date of Submission: Jan. 27^{th} 2011

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.

EXAM: Tuesday, Feb. 8^{th} at 9:00 am, ThHS

Exercises:

1. Light that has a wavelength equal to 550 nm illuminates two slits that both have widths equal to 0.030 mm and separations equal to 0.15 mm. (a) How many interference maxima fall within the full width of the central diffraction maximum? (b) What is the ratio of the intensity of the third interference maximum to one side of the center interference maximum to the intensity of the center interference maximum? (7 Points)

2. The ceiling of a lecture hall is covered with acoustic tile, which has small holes separated by about 6.0 mm. (a) Using light that has a wavelength of 500 nm, how far could you be from this tile and still resolve these holes? Assume the diameter of the pupil of your eye is about 5.0 mm. (b) Could you resolve these holes better using red light or using violet light? Explain your answer. (4 Points)

3. A person who has a near point of 80 cm needs to read from a computer screen that is only 45 cm from her eye. (a) Find the focal length of the lenses in reading glasses that will produce an image of the screen at a distance of 80 cm from her eye. (b) What is the power of the lenses? (4 Points)

4. Three slits, each separated from its neighbor by 60.0 μm, are illuminated at the central intensity maximum by a coherent light source of wavelength 550 nm. The slits are extremely narrow. A screen is located 2.50 m from the slits. The intensity is 50.0 mW/m^2. Consider a location 1.72 cm from the central maximum. (a) Draw a phasor diagram suitable for the addition of the three harmonic waves at that location. (b) From the phasor diagram, calculate the intensity of light at that location.