INSTITUT FÜR NANOSTRUKTUR- UND FESTKÖRPERPHYSIK (INF)

Physikalisches Praktikum für Studierende der Ingenieurwisschenschaften

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Diffraction at a slit / Beugung am Spalt:

1. If we want to detect light, what physical quantities can be perceived by a human eye or, e.g., by a photodiode – is it possible to measure the electrical field?
2. What is the difference between a flat and an elementary wave, what is a wave front and what does the Huygens principle maintain?
3. What happens when coherent or incoherent light hits a slit? How does the interference pattern in the first case come about and why does it not occur in the second case?
4. What happens when the slit width is reduced or increased? What are the formulas for the positions of the diffraction's minimum and its maximum of the diffraction at a single slit?
5. As opposed to a single split what is going to be different when there are two or more slits positioned with a fixed span between them?

Elasticity and torsion / Elastizität und Torsion:

1. In this experiment you are going to specify the elasticity module. Please deduce the appropriate error formula (error propagation), the equation for *E* will be noted down for you on the blackboard.
   Some of the physical quantities are specified only once. How would you estimate the errors of various quantities (e.g. of *s*) that will be implemented in the error propagation?
2. In what part of this experiment do the Newton's axioms become significant?
3. The torsion vibration is rendered by the equation $\phi(t) = \phi_0 * \sin\left(\frac{2\pi}{T_0} * t\right)$. Please derive twice $\phi(t)$ as a function of *t* and justify that equation (7) is valid due to the utilization of equation (5).
4. Does the oscillation period T_0 depend on the deflection in this model?
5. Which units take the following quantities: the moment of torque *T*, the angle deflecting force D_T, the moment of inertia *I* and the shear modulus *G*?

Momentum conservation / Impulserhaltung:

1. What kinds of impulses do we differentiate and what is the difference?
2. It takes two equations to determine the impulses of the initial ones $\overrightarrow{p1}$ and $\overrightarrow{p2}$ following the impetus $\overrightarrow{p1'}$ and $\overrightarrow{p2'}$. What are the equations applicable to both types of the impetuses?
3. A tennis ball with the initial impulse $\overrightarrow{p1}$ bounces off a wall. What kind of impetus is generated and how much energy as well as impulse are going to be carried forward onto the wall?
4. How much energy will be lost due to deformation during an inelastic collision of two identical masses $m_1 = m_2$, i.e., $v_2 = 0$.
5. Using equations you are familiar with please calculate the impulses and velocities of the two masses m_1 and m_2, to which $m_1 = 3m_2$ applies, following a flexible impetus. The mass m_2 rests before the mentioned impetus occurs, i.e., $v_2 = 0$.

Lens laws / Linsengesetze:

1. What happens to the light when it falls at an angle on a transparent medium?
2. What is formula of a lens for a focal length of a thin lens?
3. What is the technique to determine the focal length of a converting lens? (Please sketch the light beams).
4. What do we have to modify if we want to determine the focal length of a converting lens – what assumption will be made for the calculation? (For this purpose you are allowed to check the formula).
5. How do a telescope/a microscope work?

RLC oscillating circuit / RLC-Schwingkreis:

1. Please explain the Kirchhoff's laws.
2. Please describe the voltage curve and the voltage curve via a capacitor, via an ohmic resistance and via a reel respectively while switching on and off the voltage feed.
3. What is the physical significance of a blind and active resistance and the impedance *Z* respectively? Please illustrate the impedance using an example of RLC-parallel-series connection! What does the phase shift imply and what is its relation to the impedance?
4. What are the conditions under which resonance occurs?
5. What is a vector diagram? What does a band width reveal? What is the quality factor *Q*?

Specific thermic capacity / Spezifische Wärmekapazität

1. What does the (specific/molar) thermic capacity indicate?
2. What is a calorimeter?
3. What is the difference between the temperature and the thermal heat?
4. How does a "classical mixed experiment" proceed?
5. What course will the temperature-thermal heat procedure take when the physical state of the body to be heated is changed?

Thermal expansion / Wärmeausdehnung:

1. What experimental quantities do we measure in this laboratory?
2. What is the approach to calculate the coefficient of expansion? What is the formula? Which quantities must be given to carry on?
3. What constrains/forces are there in a solid state matter?
4. Why do materials expand?
5. Where in everyday life do we encounter thermal expansion?