

Ultrasonics 2023 – Demo exercise 4

Exercises 1-3 are related to the Schlieren demo and exercise 4 to the fields of transducers.
Prepare to present your answers in the exercise session 29.03.2023

1. Explain the basic principles behind schlieren imaging:

- How does the direction of propagation of a light ray change when it travels through an optically inhomogeneous (refractive index not constant) region?
- How is the Gladstone-Dale relation related to schlieren imaging?
- What do we measure and how is this achieved?
- What is the function of the knife edge in a schlieren setup?
- What is the difference between schlieren and shadowgraph techniques?
- How is schlieren imaging related to ultrasonics?

2. Describe at least two different schlieren setups that include a knife edge.

- How do they differ?
- What are the error sources?
- Pros and cons?

3. Find an article related to ultrasonics where schlieren imaging was used to obtain quantitative data of a pressure field (e.g. a shock wave or ultrasound). Write a short summary (max. half page) of the article. Focus on the following points:

- What kind of a schlieren setup was used?
- Was the schlieren setup calibrated and how was it done?
- How was the quantitative data obtained from the schlieren image?

4. Read the chapter 4 ("Field from circular transducer") from the link "Transducer focusing" on the course page.