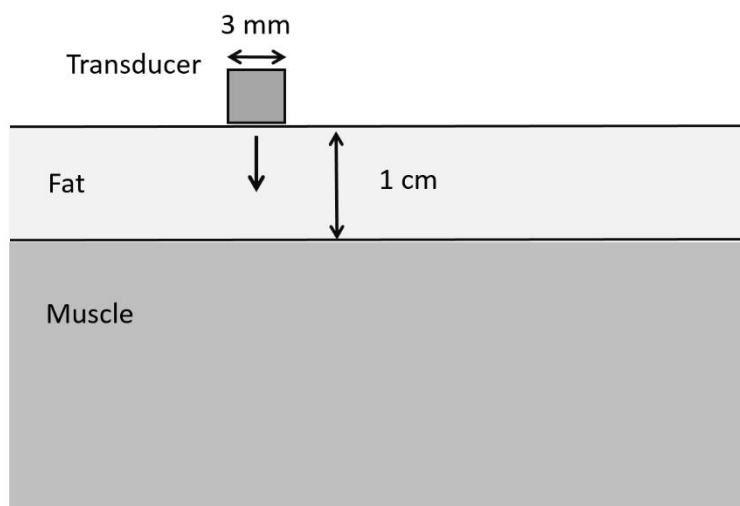


Ultrasound 1

Please prepare solutions in pdf format and upload them on the Moodle platform (<https://moodle-app2.let.ethz.ch/>).

Exercises

1. Consider an ultrasound beam that hits the boundary between two materials perpendicularly. Using the information provided in the lecture slides, show that transmission and reflection at the boundary conserve total beam intensity.
2. Consider a flat transducer with a circular face (diameter = 3 mm) performing 1D ultrasound imaging of two layers of tissue (fat, muscle) as shown below, using pulses of frequency 3 MHz and duration 1 μ s.
 - a) Where is the near-field boundary (NFB)?
 - b) Let the maximum (i.e. on-axis) pulse intensity be 10 mW/cm² at the level of the NFB. What are the on-axis pressure and intensity levels entering the muscle layer?
 - c) What is the peak particle velocity upon entrance of a pulse into the muscle layer?
 - d) At which depth in the muscle has the sound intensity dropped to 1 mW/cm²? (Assume 2 dB/cm/MHz of attenuation in muscle).
 - e) What is the lateral resolution at that depth?
 - f) What is the axial resolution in fat and muscle?



Questions?

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