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**Pulse laser induced wave propagation in graded media and
focusing devices**

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Near-infrared-laser pulses having durations of 100 fs are used to excite elastic waves thermoelastically propagating in a sub-THz frequency range. The elastic waves interact with inhomogeneities and carry information to the surface. The arrivals of the elastic pulses at the surface lead to transient changes of the optical reflectance which are monitored with short laser pulses which have a defined and controlled time delay relative to the initial pulses.

Two activities of the research group are presented:

The reflection and transmission behavior of acoustic waves propagating in graded media shows a frequency dependent nature and can therefore be used for filtering purpose. Time-boundary value problems are solved for various gradients with a finite-difference method. Results of the numerical simulation are presented and compared with laser-acoustic measurements.

A 'classical' photoacoustic set-up provides an in-depth resolution of about 5 nm whereas the lateral resolution is in the order of 5 to 10 microns. To enhance the lateral resolution of the pump-probe technique, the elastic wave propagation along structures with arbitrary tip-like geometries consisting of orthotropic material is analyzed. With such structures representing ultrasonic lenses, the elastic energy is focused to a spot size given by the sharpness of the tip thereby leading to a higher lateral resolution.