Structural dynamics in laser-excited solids investigated by femtosecond time-resolved x-ray diffraction

Klaus Sokolowski-Tinten, Institut fuer Laser- und Plasmaphysik, Universitaet Essen

Ultrashort x-ray pulses offer a unique combination of atomic-scale spatial and temporal resolution, which permits direct measurements of structural transients on an ultrafast time scale. Using time-resolved X-ray diffraction with femtosecond, multi-keV X-ray pulses we have studied transient lattice dynamics in optically excited Germanium and and Bismuth. In Germanium non-thermal melting occurs within a few hundred femtoseconds followed by strong acoustic pertubations (shock waves) on a picosecond time-scale. In Bismuth excitation of large amplitude optical phonons is observed prior to the disordering of the material.