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Picosecond Ultrasonic Measurement of Liquids[1] MADELEINE MSALL, Bowdoin College, OLIVER WRIGHT, OSAMU MATSUDA, Hokkaido University — We study acoustic waves launched using a 400 fs blue pulse (407.5 nm) from a Ti:sapphire laser, focused on a SiO_2/GaAs interface (r $\sim$ 25 μm, fluence $\leq$15 μJ/cm^2). Because of the asymmetry of the (114) GaAs, thermoelastic and piezoelastic processes generate quasishear and quasilongitudinal acoustic pulses that propagate in both materials. Pulse echoes in the thin (0.2 μm) SiO_2 layer cause a variation in optical reflectivity at the interface. In thicker layers, including the GaAs substrate and liquid layers on top of the SiO_2 surface, variations in the bulk optical reflectivity caused by the pulses can also be detected if the layer is transparent to the probe wavelength (407 or 815 nm). We look at the pulse propagation in water, ethylene glycol and glycerine. We measure a longitudinal sound velocity for glycerine of 2800 m/s, 32% larger than low frequency values, giving evidence of considerable elastic stiffening. Our pulses have central frequencies $\sim$50 GHz. A more modest 4.6% increase in the longitudinal sound velocity for water (1552 m/s) is also observed. In spite of this notable stiffening, no shear waves were observed in any of the liquids studied, indicating that propagation is still within the hydrodynamic regime.

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