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**New results on the sound velocity measurements under extreme conditions using time-resolved picosecond acoustic technique**

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In this presentation, recent works on the pressure and temperature dependence of the sound velocity will be discussed. We have used a newly developed method combining the time-resolved picosecond optical technique and a diamond anvil cell [1]. This set-up makes possible accurate measurements of the attenuation and velocity of longitudinal waves in the GHz range, and opens the elastic investigations of all materials (opaque, transparent, single- or polycrystal, liquids) up to several Mbar and thousands of K. The experimental method will be first described, with a discussion of the factors limiting the possibilities and the technique accuracy. [1] F. Decremps, L. Belliard, B. Perrin and M. Gauthier, *Phys. Rev. Lett.*, to be published in January 2008.