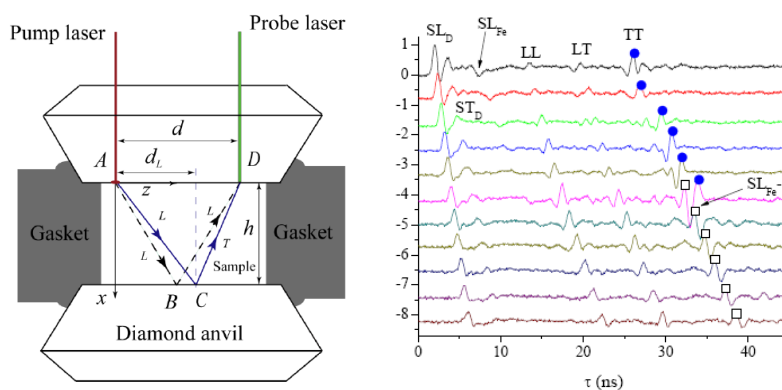


Picosecond laser ultrasonics for high-pressures research

The Laboratoire d'Acoustique de l'Université du Maine (LAUM) invites applications for a post-doctoral position dedicated to application of all-optical generation and detection of the acoustic waves, i.e. laser ultrasonics, for examination of condensed matter at extreme conditions. Laser ultrasonics (LU) [1] has well-known advantages of ability to operate without contact, from a distance, with samples of micrometers size and in hostile environment, such as extremely high temperatures, pressures or nuclear radiation. However, the first successful LU-experiments in a diamond anvil cell at pressures exceeding 10 GPa, where the information on material elasticity is obtained from the detection of the acoustic echoes bouncing inside the confined sample, had been reported just a few years ago [2,3]. This novel technique is now starting to spread from Europe to overseas.

The first experiments conducted in the LAUM in collaboration with Institut des Molécules et Matériaux du Mans (IMMM), had their particularity in the application of sub-nanosecond lasers for the generation and detection of shear acoustic waves in metals [3-6] (see Figures). Currently the second generation of the experimental setup is based on the application of the picosecond laser for the generation and detection of the excitation of shorter acoustic pulses of nanometers length in order to get better precision in time-of-flight measurements and, correspondingly, better precision in evaluation of material properties. This research activity is currently supported by a grant of the French National Research Agency (ANR). The goal of the post-doctoral research will be the extension of the applications of this innovative technique to the diagnostics of dielectric materials and pressure-induced phase-transitions in the pressure range exceeding 100 GPa. The successful candidate should demonstrate a profound knowledge in operation of picosecond lasers, and in modern methods of optical signal detection and analysis. Experience in laser ultrasonics, acoustics and/or in use of high-pressure equipment, mainly of diamond anvil cells, is of advantage.

The duration of the Post-Doctoral Fellowship is 18 months. Evaluation of submitted applications will begin on March 1st, 2014, and continue until the position is occupied. The Fellowship can be started from October of 2014 till the beginning of 2015, the latest.



1. V. E. Gusev and A. Karabutov, *Laser Optoacoustics* (New York, AIP, 1993).
2. F. Decremps, L. Belliard, B. Perrin, M. Gauthier, *Phys. Rev. Lett.* **100**, 035502 (2008).
3. N. Chigarev, P. Zinin, L.-C. Ming, G. Amulele, A. Bulou, V. Gusev, *Appl. Phys. Lett.* **93**, 181905 (2008).
4. P. V. Zinin, N. Chigarev, D. Mounier, A. Bulou, L. C. Ming, T. Acosta, V. Gusev, *J. Phys.: Conf. Series* **215**, 012053 (2010); N. Chigarev, P. Zinin, D. Mounier, A. Bulou, A. Zerr, L. C. Ming, V. Gusev, *J. Phys.: Conf. Series* **278**, 012017 (2011).
5. N. Chigarev, P. Zinin, D. Mounier, A. Bulou, L. C. Ming, T. Acosta, V. Gusev, *High Pressure Research* **30**, 78 (2010).
6. S. M. Nikitin, V. Tournat, N. Chigarev, A. Bulou, B. Castagnede, A. Zerr, and V. Gusev, *J. Appl. Phys.* **115**, 044902 (2014).

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