



CEA - Saclay 91191 Gif-sur-yvette Cedex  
Service de Physique de l'Etat Condensé - UMR 3680

## SÉMINAIRE

Mercredi 21 juin 2017 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

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## ULTRAFAST PHOTO-INDUCED STRAIN AND ACOUSTO-OPTICS IN FERROELECTRICS

Ferroelectrics are intrinsically multifunctional materials with a particular efficiency in electro-mechanical coupling which play a central role in many devices in telecommunications and sensors technologies (piezoelectric, electro-optic and acousto-optic devices). Among ferroelectrics, LiNbO<sub>3</sub> is currently employed in many acousto-optic devices for light processing but with a limited device bandwidth of tens of MHz (CMOS electronic limits). To envision new opportunities for applications, new ultrafast acousto-optic processes have to be revealed. For that, we will show that it is first necessary to control the spectrum of 10-100 GHz coherent acoustic phonons and this is currently achieved with femtosecond laser action [1-3]. Secondly, we will discuss how these high frequency coherent acoustic phonons can be used in LiNbO<sub>3</sub> or BiFeO<sub>3</sub> to manipulate the light through an efficient acousto-optic process. In particular we have revealed an original ultrafast light mode conversion process (ordinary-extraordinary) which appears to be intrinsically related to large acousto-optic coefficient of ferroelectrics while no equivalent effect was observed in the canonical birefringent CaCO<sub>3</sub> (calcite) [4]. Our results highlight new capabilities in using ferroelectrics in modern photoacoustics and photonics.

[1] Schick, D., Bojahr A., Herzog M., Gaal P., Vrejoiu I., and Bargheer. M, *Phys. Rev. Lett.* 110, 095502 (2013).

[2] Lejman M., Vaudel G., Infante, I. C., Gemeiner P., Gusev V., Dkhil B., Ruello P., *Nature Comm.* 5, 4301 (2014)

[3] H. Lee, S.S Lee, J. H. Kwak, Y-M. Kim, H. Y. Jeong, A. Y. Borisovich, S. Y. Lee, D. Y. Noh, O. Kwon, Y. Kim, J. Y. Jo, *Sci. Rep.*, 6, 38724 (2016)

[4] Lejman M., Vaudel G., Infante I-C., Chaban I., Pezeril T., Edely M., Nataf G., Guennou M., Kreisel J., Gusev V. E., Dkhil B., Ruello P., *Nature Comm.* 7, 12345 (2016).

*A coffee break will be served at 11h00. The seminar will be given in English*

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