

CEA - Saclay 91191 Gif-sur-yvette Cedex  
Service de Physique de l'Etat Condensé  
**SÉMINAIRE**

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**Mercredi 29 Mai 11h15**

**Orme des Merisiers SPEC Salle Itzykson, Bât.774**

## **Nanofiber-Based Optical Interface for Cold Neutral Atoms**

# **Arno Rauschenbeutel**

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We recently demonstrated a new experimental platform for trapping and optically interfacing laser-cooled cesium atoms [1]. The scheme uses a two-color evanescent field surrounding an optical nanofiber to localize the atoms in a one-dimensional optical lattice 200 nm above the nanofiber surface. At the same time, the atoms are efficiently interrogated with light which is sent through the nanofiber. Remarkably, an ensemble of 2000 trapped atoms yields an optical depth of up to 32, equivalent to 1.6 % absorbance per atom. Moreover, when dispersively interfacing the atoms, the nanofiber-guided light experiences a phase shift of  $\sim 1$  mrad per atom at a detuning of six times the natural linewidth [2]. Finally, we recently showed that ground state coherence times in the range of milliseconds can be achieved in our nanofiber-based atom trap [3]. This constitutes a decisive result towards establishing nanofiber-based quantum interfaces as practical building blocks in an optical fiber quantum network. In particular, they pave the way towards the realization of fully fiber-integrated quantum memories which could also be operated as highly efficient photon number-resolving detectors.

[1] E. Vetsch et al., Phys. Rev. Lett. 104, 203603 (2010).

[2] S. T. Dawkins et al., Phys. Rev. Lett. 107, 243601 (2011).

[3] D. Reitz et al., arXiv:1302.4792 (2013).

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

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