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Cold matter and short laser pulses: creating cold molecules and probing pair correlations in condensates. FRANCOISE MASNOU-SEEUWS, JORDI MUR-PETIT, ELIANE LUC-KOENIG, Laboratoire Aime Cotton 91405 Orsay France — We have analyzed the formation of Rb_2 molecules with short photoassociation pulses applied to a cold ^{85}Rb sample. The laser field couples a continuum level of the ground electronic state $X^1\Sigma_g^+$ with bound levels in the $0_u^+(5S+5P_{1/2})$ and $0_u^+(5S+5P_{3/2})$ vibrational series. The non-adiabatic coupling between the two excited channels induces time-dependent beatings in their populations [1]. We propose to take advantage of these oscillations either to probe the photoassociation process via a photoionization pulse, or to optimize the stabilization step into deep levels of the ground state [1]. Presently, in collaboration with the experimental group of Chris Westbrook in Orsay, we are extending our dynamical calculations to study the time-dependent correlations that the photoassociation laser triggers in an atomic condensate [2], and how they can be experimentally measured, *e. g.* in cold samples of metastable helium [3].
References: [1] J. Mur-Petit, E.Luc-Koenig, and F. Masnou-Seeuws, arXiv:physics/0612143. [2] P. Naidon and F. Masnou-Seeuws,*Phys. Rev. A* **73**, 043611 (2006).[3] M. Schellekens *et al.*,*Science* **310**, 648 (2005).

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