Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Coherent population transfer between hyperfine ground states of a ^{87}Rb Bose-Einstein condensate by microwave-stimulated Raman adiabatic passage SYLVAIN SCHWARTZ, MATTHIEU DUPONT-NIVET, Thales TRT, CHRIS WESTBROOK, Institut d'Optique — Microwave-stimulated Raman adiabatic passage (STIRAP) between internal states of a Bose-Einstein condensate (BEC) magnetically trapped in the vicinity of an atom chip is demonstrated by coherently transferring about 90 percent of a 7.000-atom BEC initially in the (F=2,mF=2) hyperfine level of the 5 2S1/2 ground state of 87Rb into (F=2,mF=1), using (F=1,mF=1) as an intermediate (unpopulated) level. The STIRAP protocol used in this experiment is robust to external perturbations as it is an adiabatic transfer, and power efficient as it involves only resonant (or quasi-resonant) processes. Taking into account the effect of losses and collisions in a Bloch equations model, we show that the maximum transfer efficiency is obtained for significantly non-zero values of the one- and two-photon detunings, which is confirmed quantitatively by our experimental measurements (and is shown to come mostly from inelastic collisions within (F=2,mF=1)). This work shows that microwave STIRAP between hyperfine ground states of magnetically trapped atoms is feasible, paving the way for STIRAP-based quantum information or metrology experiments integrated on a chip.

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Date submitted: 06 Feb 2015 Electronic form version 1.4