

Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Formation and decay of Bose Einstein condensates in an excited band of a double-well optical lattice SAURABH PAUL, EITE TIESINGA, Joint Quantum Institute, University of Maryland — We investigate the formation of a Bose Einstein condensate in the P-band of a double well optical lattice [1]. The lattice traps the atoms in two dimensions while confinement in the third direction is provided by a weak harmonic trap. We estimate the band structure using a tight binding(TB) model, using local simple harmonic oscillator functions. We are interested in the case when the ground s-orbital of shallow wells and the excited p-orbital of adjacent deep wells is tuned to resonance, varying the onsite energy real time. A numerical estimate of the band structure using a plane wave basis, and comparison of the tunneling parameters with that of the TB model shows that the TB model is not a good approximation for higher bands. We estimate the life time of the condensate, using TB wave functions for the four lower bands and numerical estimates for higher bands. The life time is mainly dominated by a two body collision aided decay process to the ground band. Corrections involve simultaneous transitions to the ground and other excited bands, which become progressively important with increasing lattice depth.

[1] G. Wirth et al., Nature Physics doi:10.1038/nphys1857

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Date submitted: 25 Jan 2013

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