

Abstract Submitted  
for the DAMOP17 Meeting of  
The American Physical Society

**Dark-Bright**

**Soliton Dynamics Beyond the Mean-Field Approximation<sup>1</sup>** GARYFALLIA KATSIMIGA, GEORGIOS KOUTENTAKIS, SIMEON MISTAKIDIS, University of Hamburg, PANAGIOTIS KEVREKIDIS, University of Massachusetts, PETER SCHMELCHER, University of Hamburg, THEORY GROUP OF FUNDAMENTAL PROCESSES IN QUANTUM PHYSICS TEAM — The dynamics of dark bright solitons beyond the mean-field approximation is investigated. We first examine the case of a single dark-bright soliton and its oscillations within a parabolic trap. Subsequently, we move to the setting of collisions, comparing the mean-field approximation to that involving multiple orbitals in both the dark and the bright component. Fragmentation is present and significantly affects the dynamics, especially in the case of slower solitons and in that of lower atom numbers. It is shown that the presence of fragmentation allows for bipartite entanglement between the distinguishable species. % to be also generically observed. Most importantly the interplay between fragmentation and entanglement leads to the decay of each of the initial mean-field dark-bright solitons into fast and slow fragmented dark-bright structures. A variety of excitations including dark-bright solitons in multiple (concurrently populated) orbitals is observed. Dark-antidark states and domain-wall-bright soliton complexes can also be observed to arise spontaneously in the beyond mean-field dynamics.

<sup>1</sup>Deutsche Forschungsgemeinschaft (DFG) in the framework of the SFB 925 “Light induced dynamics and control of correlated quantum systems”

Garyfallia Katsimiga  
University of Hamburg

Date submitted: 11 Apr 2017

Electronic form version 1.4