

# Generation of Dark-Bright Soliton Trains in Superfluid-Superfluid Counterflow

Systemic identification and entanglement process in the dynamics.

DOI: [10.1103/PhysRevLett.106.065302](https://doi.org/10.1103/PhysRevLett.106.065302)

PACS numbers: 67.85.De, 03.75.Kk, 05.45.Yv, 47.40.-x

Nonlinear structures in dilute-gas Bose-Einstein condensates (BECs) have been the focus of intense research efforts, deepening our understanding of quantum dynamics and providing intriguing parallels between atomic physics, condensed matter, and optical systems. For superfluids that are confined in a narrow channel, one of the most prominent phenomena of nonlinear behavior is the existence of solitons in which a tendency to disperse is counterbalanced by the nonlinearities of the system. In single-component





repeatable manner, as is evidenced by the fact that all images of Fig. 2(a) form a very consistent sequence even though they were taken during different runs of the experiment. In addition to repeatability, future studies may also require a long lifetime of the solitons. In single-component BECs, achieving long lifetimes of dark solitons has proven difficult as they are subject to a transverse instability [5,8]. Only recently have dark soliton lifetimes of up to 2.8 sec been achieved [6]. It has been conjectured [19] and numerically confirmed [20] that dark-bright solitons are more