

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

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The dynamics of two penetrating superfluids exhibit an intriguing variety of nonlinear effects. Using two distinguishable components of a Bose-Einstein condensate, we investigate the counterflow of two superfluids in a narrow channel. We present the first experimental observation of trains of dark-bright solitons generated by the counterflow. Our observations are theoretically interpreted by three-dimensional numerical

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