

# Nonlinear waves in coherently coupled Bose-Einstein condensates

T. Congy, A. M. Kamchatnov and N. Pavloff

## **Abstract**

We consider a quasi-one-dimensional two-component Bose-Einstein condensate subject to a coherent coupling between its components, such as realized in spin-orbit coupled condensates. We study how nonlinearity modifies the dynamics of the elementary excitations. The spectrum has two branches which are affected in different ways. The upper branch experiences a modulational instability which is stabilized by a long wave-short wave resonance with the lower branch. The lower branch is stable. In the limit of weak nonlinearity and small dispersion it is described by a Korteweg-de Vries equation or by the Gardner equation, depending on the value of the parameters of the system.