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Modulational instability for standing waves solutions to a periodic nonlinear Schrodinger equation.

We consider the standing wave solutions to a nonlinear Schrodinger equation. The question of linear stability of such solutions leads to a pair of non-self-adjoint coupled periodic Schrodinger equations. We use the Hamiltonian structure and the $U(1)$ symmetry of the original equation to derive a sufficient condition for the existence of a band of unstable wavenumbers around the origin (a modulational instability). In the limit of weak nonlinearity this condition reduces to the following: focusing solutions which bifurcate from the lower bands edges, and defocusing solutions which bifurcate from the upper band edges, are unstable. We also derive some results from finite wavelength instabilities, in particular a condition on the allowed bifurcations in terms of the Krein signature of the underlying linear problem. (Received February 13, 2006)