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*Diagonalization of the Hamiltonian Coupled-mode System in the Presence of Symmetry*

We consider the Hamiltonian coupled-mode system derived in nonlinear optics, photonics, and atomic physics. Since the Dirac energy is not bounded, the standard stability analysis based on Lyapunov functionals does not work for gap solitons. Spectral stability of gap solitons depends on eigenvalues of the linearized coupled-mode equations, which are equivalent to a four-by-four Dirac system with sign-indefinite metric. In the special class of symmetric nonlinear potentials, we construct a block-diagonal representation of the linearized couple-mode equations when the spectral problem reduces to two coupled two-by-two Dirac systems.