

# Rational solitons in deep nonlinear optical Bragg grating

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## Abstract

We have examined the rational solitons in the Generalized Coupled Mode model for a deep nonlinear Bragg grating. These solitons are the degenerate forms of the ordinary solitons and appear at the transition lines in the parameter plane. A simple formulation is presented for the investigation of the bifurcations induced by detuning the carrier wave frequency. The analysis yields among others the appearance of in-gap dark and antidark rational solitons unknown in the nonlinear shallow grating. The exact expressions for the corresponding rational solitons are also derived in the process, which are characterized by rational algebraic functions. It is further demonstrated that certain effects in the soliton energy variations are to be expected when the frequency is varied across the values where the rational solitons appear.

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