Generation and propagation of optical pulses in degenerate laser amplifiers

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Abstract

We study generation and propagation of optical pulses in inversely populated two-level atomic media with degenerate energy levels. Because of this degeneracy the associated Maxwell-Bloch-type equations are not integrable and thus the inverse scattering and other integrability-based methods cannot be utilized. Nevertheless, our analysis based on variety of analytical, numerical, and asymptotic techniques allows us to gain insights in various features of pulse propagation such as pulse stability, velocity, and interaction of soliton-like structures with background radiation.