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Femtosecond pulses in a dense two-level medium: Spectral transformations, transient processes, and collisional dynamics

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Propagation of ultrashort optical pulses in a dense resonant medium is considered in the semiclassical limit. In our analysis, we place emphasis on several main points. First, we study transformations of spectra in the process of pulse propagation and interactions with another pulse. The second point involves the transient processes (including pulse compression) connected with self-induced transparency soliton formation inside the medium. Finally, the third aspect is the study of collisions of co- and counter-propagating pulses in the medium. In the last case, the investigation of symmetric and asymmetric collisions shows the possibility of effectively controlling the parameters of transmitted radiation.

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