Filamentation and coalescence of singular optical pulses in narrow-gap semiconductors and modeling of self-organization of vortex solitons using two-photon absorption

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Résumé en anglais	Short intense laser pulses with phase singularity propagating in narrow-gap semiconductors are modeled. The saturating nonlinearity is a prerequisite for self-organization of pulses into solitons. The cubic-quintic saturation appears due to the conduction-band nonparabolicity in synergy with the free carriers excitation through two-photon absorption. The pulse stability analyzed using Lyapunov's method is confirmed by numerical simulations. Depending of its power, a singular Gaussian pulse far from equilibrium either filaments or subsequently coalesces evolving toward vortex soliton. Above breaking power, such a vortex soliton resists to azimuthal symmetry-breaking perturbations.
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