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Non-perturbative effects for the BFKL equation in QCD and in N=4 SUSY

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We remind, that the high energy behavior of scattering amplitudes in QCD is described by the BFKL equation for the pomeron as a composite state of reggeized gluons. In the leading logarithmic approximation its hamiltonian has a number of remarkable properties including its Moebius invariance, holomorphic separability and integrability. These properties are valid also for the BKP equation describing the multi-gluon composite states in the t'Hooft limit. Generally the BFKL hamiltonian is integrable only at N=4 SUSY where we calculate its eigenvalues in a semiclassical approximation beyond perturbation theory. Due to the asymptotic freedom the spectrum of the BFKL hamiltonian in QCD is discreet, but for its calculation one needs boundary conditions for eigenfunctions. We discuss various modifications of the BFKL equation in the confinement region, including the Higgs mechanism and the conformal mapping of the inact parameter plane to the spaces with cylinder and compact topologies.

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