# A Jastrow wave function for the spin-1 Heisenberg chain: string order revealed by the mapping to the classical Coulomb gas


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We show that a two-body Jastrow wave function is able to capture the ground-state properties of the $S = 1$ antiferromagnetic Heisenberg chain with the single-ion anisotropy term, in both topological and trivial phases [1]. Inspecting the Jastrow wave function, optimized using the stochastic reconfiguration technique [2], we recognize that its pseudo-potential assumes a very simple form in Fourier space, i.e., $v_q \approx 1/q^2$, which is able to give rise to a finite string-order parameter in the topological regime. The results are analysed by using an exact mapping [3] from the quantum expectation values over the variational state to the classical partition function of the one-dimensional Coulomb gas of particles with charge $q = \pm 1$. Here, two phases are present at low temperatures: the first one is a diluted gas of dipoles (bound states of particles with opposite charges), which are randomly oriented (describing the trivial phase); the other one is a dense liquid of dipoles, which are aligned thanks to the residual dipole-dipole interactions (describing the topological phase, with the finite string order being related to the dipole alignement). Our results provide an insightful interpretation of the ground-state nature of the spin-1 antiferromagnetic Heisenberg model.



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