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Brownian Gas: a field theory with a Poissonian ground state¹ ANDREA VELENICH, CLAUDIO CHAMON, Physics Department, Boston University, DIRK KREIMER, Institut des Hautes Etudes Scientifiques and Department of Mathematics and Statistics, Boston University — As a first step towards a satisfying field theory of Brownian particles in interaction, we study exactly the non-interacting case, its combinatorics and its non-linear time-reversal symmetry. The field theory is nevertheless interacting: the vertex is the hallmark of the original particle nature of the gas and enforces the constraint of a strictly positive density field as opposed to a Gaussian free field. We compute exactly all the n-point density correlation functions, determine non-perturbatively the Poissonian nature of the ground state and emphasize the futility of any coarse-graining assumption for the derivation of the field theory.

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