Influence of the exchange symmetry on the one-particle picture

Christian Schilling[1]

[1]*Clarendon Laboratory, University of Oxford, Parks Road, Oxford OX1 3PU, United Kingdom*

We provide an introduction into the generalized Pauli constraints which constrain the one-particle picture of fermionic quantum systems. By a comprehensive study of a model system we show that the conflict between energy minimization and fermionic exchange symmetry leads to their (approximate) saturation for ground states. We explain why such (quasi)pinning of fermionic occupation numbers implies remarkable insights into the structure of the corresponding N-fermion quantum state.

To explore the role of the exchange symmetry from a different viewpoint, we then continue by interpolating between fermions and bosons: We show for N hard-core bosons on an arbitrary lattice with d sites and independent of additional interaction terms that the hard-core constraint itself already enforces a universal upper bound on the Bose-Einstein condensate given by $N_{max} = (N/d)(d - N + 1)$.