

Convex N -Representability

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Abstract

The set of all possible spectra of 1-reduced density operators for systems of N particles on a d -dimensional Hilbert space is a polytope called hypersimplex. If the spectrum of the original density operators is fixed, the set of spectra (ordered decreasingly) of 1-reduced density operators is also a polytope. A theoretical description of this polytope using inequalities was provided by Klyachko in the early 2000s. Adapting and enhancing tools from discrete geometry and combinatorics (symmetric polytopes, sweep polytopes, and the Gale order), we obtained some necessary inequalities explicitly, that are furthermore valid for arbitrarily large N and d . These may therefore be interpreted as generalizations of Pauli's exclusion principle for fermions.