Abstract Submitted
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Sum rules for spin-1/2 quantum gases in well-defined-spin states VLADIMIR YUROVSKY, School of Chemistry, Tel Aviv University — A many-body eigenstate of spin-1/2 atoms with the defined total spin is represented as a sum of products of the spin and spatial wavefunctions, dependent on spins or coordinates, respectively, of all atoms. Unless the total spin has the maximal allowed value, the spin and spatial functions belong to multidimensional, non-Abelian, irreducible representations of the symmetric group, beyond the conventional paradigm of symmetric-antisymmetric functions. The symmetric group methods allow to evaluate the matrix elements between these wavefunctions for spin-dependent external fields and two-body interactions. These matrix elements agree to the selection rules [1]. Explicit dependence on the total spin projection is obtained [2] using the Wigner-Eckart theorem. Analytical expressions are obtained [2] for sums of the matrix elements and sums of their squared modules over irreducible representations. The sum rules are applied to perturbative analysis of energy spectra.

[1] V.A. Yurovsky, Phys. Rev. Lett. **113**, 200406 (2014).
[2] V.A. Yurovsky, arXiv:1501.06182.

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