



物理 談話会のご案内

Making statistics work: a quantum engine in the
BEC-BCS crossover

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場所: 杉本キャンパス理学部棟第4講義室(F205)

概要: We present a new class of many-body quantum engine that we termed Pauli engine. Our engine exploits genuine nonclassical forms of energy different from heat, which have not been used until now for work production in cyclic engines. In the Pauli engine the energy input is not related to the temperature of an external bath, instead, our machine is fueled by the energy associated with the change of the statistical behavior of the working medium from bosonic to fermionic and back. This mechanism is of purely quantum origin and has no correlate in the classical regime. Since the change in quantum statistic does not require the coupling to a hot or cold reservoir, the main advantage of the Pauli engine is that it is free of the dissipation processes of conventional engines. We experimentally realized the Pauli cycle by driving a trapped ultracold two-component Fermi gas of Li atoms between a Bose-Einstein condensate of bosonic molecules and a unitary Fermi gas. Such experiments result in a work output of several 10^6 vibrational quanta per cycle with an efficiency of up to 25%. Our findings establish quantum statistics as a useful thermodynamic resource for work production in a new class of emergent quantum engines.

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