

Does matter wave amplification work for fermions?

Several recently observed phenomena Bose-Einstein condensates, superradiance of atoms, four-wave mixing and matter wave amplification were described as processes which are bosonically stimulated, i.e., their rates are proportional to $(N+1)$, where N is the number of identical bosons in the final state. However, we had pointed out that atomic superradiance does not depend on Bose-Einstein statistics and would occur for thermal atoms or even for fermions, although with a much shorter coherence time [1]. These suggestions have stirred a controversy among researchers.

In Ref. [2], we reconciled the different physical descriptions with the central result that the stimulated processes mentioned above do not rely on quantum statistics, but rather on symmetry and coherence. Bosonic quantum-degeneracy is sufficient, but not necessary for these processes. It represents only one special way to prepare a system in a cooperative state which shows coherent and collective behavior.

1. S. Inouye, A.P. Chikkatur, D.M. Stamper-Kurn, J. Stenger, D.E. Pritchard, and W. Ketterle, *Science* **285**, 571 (1999).
2. W. Ketterle and S. Inouye, *Phys. Rev. Lett.* **86**, 4203 (2001).