



FRONTIERS IN OPTICAL COHERENT AND ULTRAFAST SCIENCE

A NATIONAL SCIENCE FOUNDATION PHYSICS FRONTIER CENTER AT
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A nugget from FOCUS:

Title: Number squeezing in a Degenerate Bose Gas

Investigators

Mark Raizen, The University of Texas at Austin

The Raizen group has created atomic number squeezing in a degenerate Bose gas and has observed this state by direct atom number counting. To create this state they developed a BEC confined in a small optical box. The number is reduced to a controlled level by slowly reducing the wall height, a process they call quantum evaporation. The result is a degenerate gas with measured number fluctuations that are a factor of two below shot noise. The residual noise can be attributed to technical sources, so that the observations are consistent with many-body Fock-state production. The atomic numbers varied from 500 down to 60 atoms and smaller numbers are now being produced. Many-body Fock states are the building block for atomic entanglement and quantum computing. More generally, this work opens the door for the study of quantum atom statistics in many-body systems, and parallels the study of photon statistics in quantum optics.