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Measuring Relative Atom Number Fluctuations in Coherently Split Quantum Degenerate Gases MARCIUS H.T. EXTAVOUR, JASON MCKEEVER, LINDSAY J. LEBLANC, DYLAN JERVIS, ALAN STUMMER, Department of Physics, University of Toronto, THORSTEN SCHUMM, Vienna University of Technology, JOSEPH H. THYWISSEN, Department of Physics, University of Toronto — We report on direct measurements of atom number fluctuations in a double-well Bose Einstein condensate (BEC) system. A single BEC is dynamically and coherently split into two halves – left (L) and right (R). This is accomplished by deforming a single 3-dimensional harmonic magnetic trap into a double-well trap by combining static and time-varying radio-frequency magnetic fields on an atom chip. Fluctuations in the relative atom number Nr = NR - NL in repeated trials are evaluated against the shot-noise preduction of binomial statistics. We determine the atom number statistics of the splitting process by directly measuring the atom numbers in the left and right wells after splitting, and the fluctuations in the relative atom number in successive repetitions of the experiment using time-of-flight absorption imaging. We will discuss possible extensions of this method to measurements of splitting statistics using a degenerate Fermi gas.

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