Sodium Bose-Einstein Condensates in the F=2 State in a Large-volume Optical Trap

We have investigated the properties of Bose-Einstein condensates of sodium atoms in the upper hyperfine ground state in a purely optical trap [1]. Condensates in the high-field seeking $|F=2, m_F=-2\rangle$ state were created from initially prepared $|F=1, m_F=-1\rangle$ condensates using a one-photon microwave transition at 1.77 GHz. The condensates were stored in a large-volume optical trap created by a single laser beam with an elliptical focus. This resulted in lower densities and longer lifetimes of the condensates. We found condensates in the stretched state $|F=2, m_F=-2\rangle$ to be stable for several seconds at densities in the range of 10^{14} atoms/cm^3. In addition, we studied the clock transition $|F=1, m_F=0\rangle \rightarrow |F=2, m_F=0\rangle$ which is to lowest order insensitive to stray magnetic fields and determined a density-dependent frequency shift (the so-called clock shift).

1. A. Görlitz, T.L. Gustavson, A.E. Leanhardt, R. Löw, A.P. Chikkatur, S. Gupta, S. Inouye, D.E. Pritchard, and W. Ketterle, *Sodium Bose-Einstein Condensates in the F=2 State in a Large-volume Optical Trap*, Phys. Rev. Lett. **90**, 090401 (2003).