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> state were created from initially prepared |F=1, m_F=-1> 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> 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> $\rightarrow$ |F=2, m_F=0> which is to lowest order insensitive to stray magnetic fields and determined a density-dependent frequency shift (the so-called clock shift).