

Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Influence of sub-Doppler force on the Doppler trap parameters of a magneto-optical trap HEUNG-RYOUL NOH, Department of Physics, Chonnam National University, Gwangju 500-757, Korea, KIHWAN KIM, WONHO JHE, School of Physics and Center for Near-field Atom-photon Technology, Seoul National University, Seoul 151-742, Korea — We have measured the trap frequency as well as the damping coefficient of a magneto-optical trap by using a transient oscillation method. The dependence of such trap properties on the various experimental parameters such as the cooling laser intensity, detuning, and magnetic field gradient is investigated. We find that the measured trap frequency is in excellent agreement with the simple rate-equation analysis based on the Doppler cooling theory. In contrast, the damping coefficient is about twice larger than the calculated one, which is attributed to the existence of the sub-Doppler trap near the trap center. We also have shown for the multi-level atom the trap parameters are affected by the laser intensity, detuning of other directions. From the measurement of the damping coefficient, we have found that the trap parameters are affected by the sub-Doppler force. These observations are explained by the direct calculation of the force where the detuning of transverse laser is different from the considered axis.

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Date submitted: 11 Mar 2005

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