Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Laser cooling of rubidium atoms in an integrating sphere LIANG LIU, Shanghai Institute of Optics and Fine Mechanics, HUADONG CHENG, WENZHUO ZHANG, LING XIAO, YUZHU WANG — Recently laser cooling of atoms directly from the vapor background in diffuse laser light has received a lot of attention because of its application to making a compact, cold atom clock. In this work we describe an experiment on laser cooling of ^{87}Rb atoms directly from the vapor background in diffuse light. Diffuse light is produced in a ceramic integrating sphere by multiple scattering of two laser beams injected through multi-mode fibers. We measured the absorption spectra of cold atoms by scanning the frequency of a probe beam. We also measured the time dependence of the absorption of a probe beam after the cooling light is switched off. With this method, we can eliminate the saturation effect of the cooling light on the cold atoms, and observe the real absorption of probe beam. In order to increase the number of captured cold atoms, we injected two frequency cooling lasers. Atoms with high velocity are cooled by large-detuned light, and those with low velocity by small-detuned light. A combination of two frequency lasers leads to a larger cooling range, and thus can capture more cold atoms. In our experiment, two frequency cooling captured cold atoms two times more than single frequency cooling, and up to 4×10^9 cold atoms are obtained.

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Date submitted: 21 Jan 2009 Electronic form version 1.4