Raman transitions of free falling atoms for an atomic gravimeter developing at KRISS

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Raman transitions are being used to induce a large momentum transfer to free falling atoms for an atomic gravimeter. In this conference, we will introduce preliminary results about Raman spectrum including current status of an atomic gravimeter developing at KRISS. Our MOT (Magnetic Optical Trap) chamber for an atomic gravimeter has 1,1,1 geometric configuration with three fold symmetry cooling beams (three upward beams, three downward beams) about vertical axis. The laser system consists of three home-made external cavity diode lasers (ECDL), whose one laser and another laser is alternately used as a repumper and a mater Raman laser and as a cooling laser and a slave Raman laser, respectively[1]. We obtained the temperature of 5μK by a deep cooling after MOT of Rubidium-87 (Rb^{87}) atoms. We investigated Raman transitions between two ground states (F=1, 2) for the free falling Rb^{87}atoms by co-propagating Raman pulse as shown in Fig.1 before obtaining interference fringes in the Mach-Zehnder-type interferometer using $\pi/2 - \pi - \pi/2$ sequence of counter-propagating Raman pulses. Fig.1 (a) shows typical side lobes induced by a square pulse. The decay of the Rabi oscillation amplitude for increasingly longer pulse lengths in Fig.1 (b) is attributed to Gaussian envelope of Raman beam intensity with finite size.

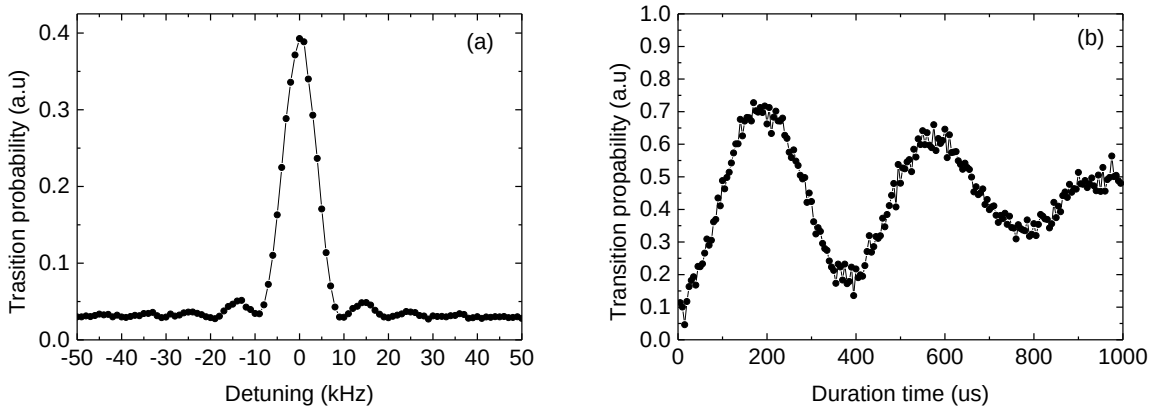

Fig.1: (a) The frequency dependence of transition probability and (b) Rabi oscillation for co-propagating Raman pulse in $\sigma^+ - \sigma^+$ in configuration corresponding to Doppler insensitive transitions.

[1] P. Cheinet, F. Pereira Dos Santos, T. Petelski, J. Le Gouet, J. kim, K. T. Therkildsen, A. Clairon, A. Landragin, "Compact laser system for atom interferometry", *Appl. Phys*. B, vol. 384, p. 643-646, 2006.