Evaluation the Number of Atoms in Conical Magneto-optical Trap

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Compact and robust magneto-optical trap (MOT) with simple design has obvious advantage in the development of atomic sensors[1]. One of the key elements of atomic fountains and interferometers is a cold-atom source. We have developed and investigated the conical magneto-optical trap as a source of slow atoms[2]. This source has a relatively simple construction, since it has a single laser beam to produce the optical fields required for laser cooling and easy vacuum chamber (Fig.1). Moreover, the number of trapped atoms in the conical MOT are comparable with conventional MOTs.

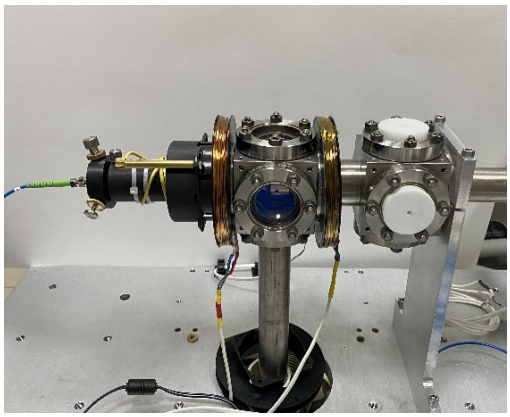

Fig. 1: The source of slow atoms with the conical mirror reflector.

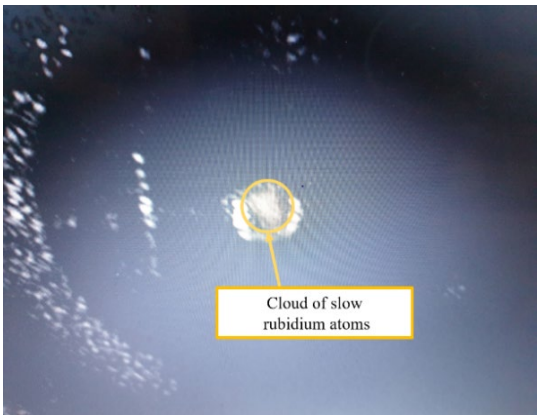

Fig. 2: The cloud of trapped rubidium atoms in the conical MOT.

We will present the specification of a conical magneto-optical trap as a slow atoms source and the obtained experimental results. Our main goal is to estimate the number of atoms in the trapped cloud in the conical magneto-optical trap (Fig.2). We have used method for evaluation based on analysis of trapped cloud images obtained on an ultra-sensitive triggering camera at different time moments of the atomic cloud accumulation.

[1] S. Ravenhall, B. Yuen, and C. Foot, “High-flux, adjustable, compact cold-atom source, 2021, Vol.29, No. 14/5, Optics Express..

[2] E.S. Aleinikova, E.V. Ivanchenko, D.S.Kupalov, O.V. Kupalova, “Investigation of Conical Magneto-Optical Trap As a Source of Slow Atoms”, Symposium Proceedings IFCS-EFTF 2023, 7201.