Principal Experiments dependencies of the helical confinement efficiency in helical mirror SMOLA [[1]](#footnote-1)\*)

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The concept of the dynamic multiple-mirror confinement by the controlled plasma rotation in the helical magnetic mirrors was proposed to improve an energy confinement time and improve fusion gain in future linear magnetic traps [1]. Theory predicts exponential dependence of the plasma flow suppression effectiveness on the helical mirror length, and, therefore, significant rise of the effective mirror ratio [2].

The concept is being explored on the experimental device SMOLA in Budker INP [3]. The main part of the device is single 216-cm-long helical plug, which contains 12 periods of the helicity. Helical and axial magnetic field ratio varies arbitrary. Plasma rotation is driven by the controlled profile of the radial electric field and is similar to the vortex confinement system in GDT, thus this system may be used for plasma stabilization. Plasma is confined between the helical plug and plasma gun, which is located in the maximum of the magnetic field. Flow suppression effectiveness may be determined by measuring of the plasma parameters change along the mirror in different regimes of the magnetic and electrical field. Project parameters are as follows: ni~1019 m-3, guide field in helical section up to Bmax = 0.1 – 0.3 T, radial electric field up to Er ~ 100 V/cm, plasma radius r ~ 5 cm, helicity period 18 cm, mean corrugation along the field line Rmean = 1.5 – 2 [4].

An ability to suppress the plasma outflow was demonstrated previously [5]. Experimental scalings show the rise in plasma suppression effectiveness with the mean corrugation ratio, rotation velocity and guide magnetic field rising independently. Experimental dependencies of the effectiveness in broader range of the magnetic configurations for hydrogen and helium plasma is presented in this report, alongside with the longitudinal density profiles in different confinement regimes.

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Literature

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Mu/ru/AH-Sudnikov.docx) [↑](#footnote-ref-1)