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Plasma transport in linear and helical multiple-mirror systems

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The challenge of creation of an open trap with the reactor-grade plasma is achievable if such trap will use specialized sections of the magnetic system for suppression of particle and energy losses along the magnetic field. Currently, two new experimental devices are under construction in the Budker Institute for studies of physics of plasma confinement in magnetic systems with multiple-mirror configurations. Linear topology of the traps enables early start of experiments with plasma before the completion of the magnetic and vacuum systems. In the paper, we will report experimental results on the transport of a low-temperature start plasma flow through a section with a multiple-mirror magnetic field as well as the direct comparison with the case of solenoidal magnetic field. In the final configuration of GOL-NB, that plasma stream will be used as the target for the capture of heating neutral beams. In 2017, new SMOLA helical multiple-mirror trap achieved the first plasma. In this trap, plasma rotation is used for creation of moving magnetic mirrors in the rotating frame of reference. An active plasma pumping by the moving magnetic mirrors can deliver an exponential dependence of the confinement efficiency on the system length. Modification of the plasma flow profile at helical mirror confinement was demonstrated in the experiment. Main results from the first experimental campaign will be discussed.

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