PERSPECTIVE ELEMENTS in GDMT Design

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The gas-dynamic multiple-mirror trap (GDMT) is the project of the new-generation open trap that is being developed in the Budker Institute of Nuclear Physics since 2011 [1]. The original concept was based on a combination of multiple-mirror enhancement of axial confinement, justified in GOL-3 experiments [2], and a central cell with sloshing ions, to reproduce confinement regimes of GDT [3]. Currently, both the original design and the theoretical foundations of the project are outdated. The project is returned into the conceptual design stage, while the emerging new proposals are undergoing theoretical and experimental verification. In particular, the new trap with helical field corrugation, SMOLA [4], is being constructed. It is intended for verification of the concept of rotating-plasma pumping in such magnetic configuration. An important feature of this system in comparison with the standard passive multiple-mirror confinement is the enhanced scattering of plasma ions due to trapped-particle instability that should serve to improve the effectiveness of suppression of axial losses. The second new element of the project is the diamagnetic regime of plasma confinement in the central cell of the trap that should increase the effective mirror ration and confinement time at high beta [5]. Today it is important to understand how would look like and what properties possess a new open trap, incorporating in its construction the new ideas of helical multiple-mirror sections and diamagnetic confinement. Are these innovations compatible with each other? What advantages one could expect as compared to the original GDMT design? What changes are expected in terms of requirements for heating, stabilization and other subsystems of the trap? What preliminary experiments should be conducted to ensure operability of the new trap? In this work the new perspective design of the GDMT trap is presented and analyzed. In case of operability of new elements it will allow to reach QDT>1 within the previous trap dimensions.

References

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