Low-frequency plasma oscillations in the helical open trap SMOLA [[1]](#footnote-1)\*)

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To achieve the confinement parameters necessary for thermonuclear applications of open traps, new methods of suppressing the plasma flux directed along the magnetic field lines are required. At the BINP, a new confinement method called as helical confinement was developed [1] and is being experimentally tested at the SMOLA device [2]. The method consists in creating a dynamic multiple-mirror system by plasma rotation in helical magnetic field. As a result, the trapped particles, moving with the field maxima, create a reverse flow towards the confinement zone. The obtained results are in agreement [3] with theoretical estimates.

For effective confinement in a multi-mirror trap, it is necessary that the mean free path of particles is approximately equal to the length of one cell. However, taking into account only Coulomb collisions and high temperatures, which are typical for thermonuclear applications, this condition is not satisfied in practice. The occurrence of anomalous collisionality in this case can improve the confinement. Thus, in experiments on the GOL-3 device, bounce oscillations led to an increase in the energy plasma lifetime [4]. The growth of instabilities at the SMOLA device can be caused by a flow of trapped particles.

The obtained in the last experimental series results of the studying long-wave oscillations in plasma will be presented in the report. As a result, of the data processing of the experimental series, carried out at various magnetic field strengths and plasma densities, using the method of principal components, an oscillation correlated over the entire length of the device, typical for the confinement mode, was found. In the field range of 40 - 70 mT, the oscillation frequency lies in the range of 20 - 50 kHz, linearly depending on the parameter $B/\sqrt{ρ}$, which is proportional to the Alfven velocity. Also, a necessary for observing this oscillation condition was found for the ratio of the field strength and the degree of corrugation. The issue of the connection between these oscillations and anomalous collisions is discussing.

References

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