Study of deuterium fast ions instabilities in hydrogen bulk plasma in gdt [[1]](#footnote-1)\*)

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Plasma in the axisymmetric open-ended magnetic trap GDT (BINP SB RAS) consists of two components: neutral deuterium beams are injected into the bulk isotropic plasma, so that the population of the fast anisotropic ions is formed as a result of the resonant charge exchange. Distribution function anisotropy causes the excitation of kinetic instabilities of various types that can lead to the fast ions losses. It is known that the presence of the warm isotropic ions of the same type as the fast ones stabilizes the drift cyclotron loss-cone instability (DCLC) [1]. In addition, theory predicts that the presence of warm ions, whose cyclotron harmonics coincide with some harmonics of the fast ions, can also suppress the DCLC at corresponding frequencies [2].

Presented work is devoted to the study of the mode structure and determination of the characteristic types of the fast ions instabilities excited in the hydrogen bulk plasma added with deuterium ions. The signals obtained using high-frequency magnetic probes and an ADC with a sampling rate of 500 MHz were processed by the cross-spectrum method, so that azimuthal and longitudinal wavenumbers for instabilities in the frequency range from 1 to 10 MHz were determined. The values of frequencies and azimuthal wavenumbers suggest that DCLC instability is observed. The instability is accompanied by an abrupt change in the diamagnetic signals that indicates the scattering of the fast ions. A series of experiments made it possible to trace the change in characteristics of instabilities and their consequences such as scattering of fast ions when deuterium is added to the hydrogen bulk plasma.

References

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2. I.A. Kotelnikov, I.S. Chernoshtanov. Phys. Plasmas 25 082501 (2018)

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