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DIAGNOSTICS OF FAST IONS AND RELATED INSTABILITIES BASED ON COLLECTIVE THOMSON SCATTERING OF MICROWAVE RADIATION FOR OPEN MAGNETIC TRAP GDT *)

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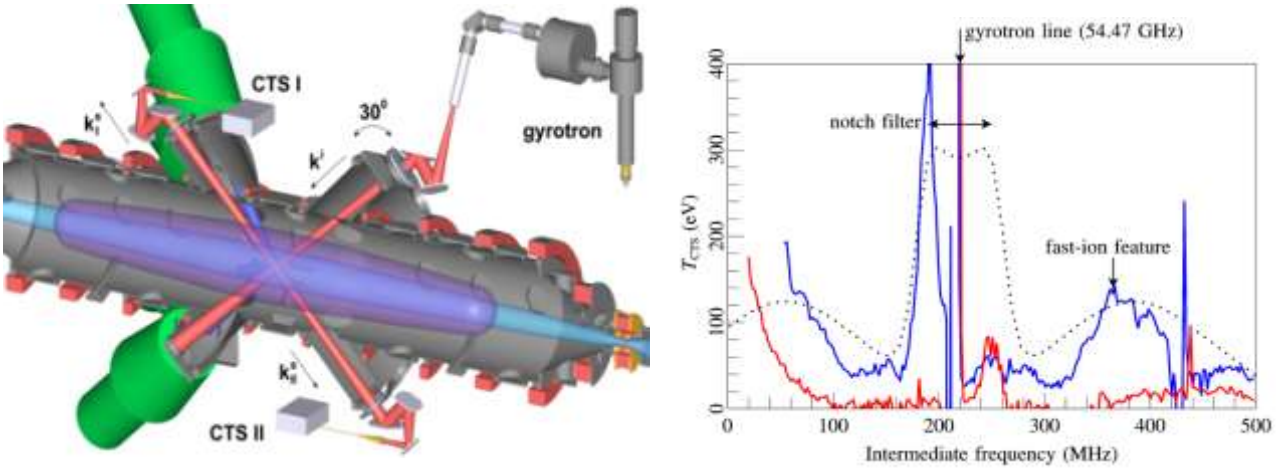
For the large-scale magnetic trap GDT (Budker Institute of Nuclear Physics SB RAS, Novosibirsk), a system for recording collective Thomson scattering spectra (CTS) of microwave radiation has been developed, which makes it possible to study the velocity distribution function of fast ions and the instability of high-temperature plasma with subthermonuclear parameters. A diagnostic complex has been created, including a powerful 450 kV / 54.5 GHz gyrotron as a source of probing radiation, two independent highly sensitive radiometers operating in the range of 54.47±0.55 GHz for simultaneous registration of scattered radiation in "orthogonal" geometries, quasi-optical systems for focusing the probing and scattered radiation. Methods have been developed for modeling the propagation and scattering of microwave beams in an inhomogeneous plasma with the accuracy necessary for interpreting the experiment.



CTS diagnostics and the first scattered signal from the fast ions by GDT [1]

In this paper, we discuss the results of experimental campaigns of 2022 and 2023 at the GDT facility with plasma heating by neutral beams, in which the CTS measurement technique has been developed and scattering signals from fast ions have been recorded for the first time for large open traps. Information is also provided on future plans, including improvement of receiving equipment and a possible implementation of a new scattering geometry.

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References

[1]. A.G. Shalashov, et al., Phys. Plasmas, 29, 080702 (2022)

*) abstracts of this report in Russian