modeling of the FAST ion behaviour in the globus-m tokamak

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Many codes, used for the fast ion modeling in the conventional tokamaks cannot be applied to the spherical machines because of the low magnetic field and its high gradient. Existing codes need experimental verification and crosscheck before they will be applied for the calculation of the fast ion losses in the future compact neutron sources and two-component reactors. However there are only few spherical tokamaks suitable for these tests. The results of the fast ion modeling in the Globus-M tokamak are presented in his work.

Two codes were used: NUBEAM [1] and 3D ion tracking algorithm [2] combined with the solution of the Boltzmann kinetic equation [3]. Since these codes utilize different approaches, crosscheck is possible. Calculated fast ion losses are in a relatively good agreement with the experimental results, obtained during the 18-30 keV H and D neutral beam injection (NBI) in the Globus-M tokamak. Modeling revealed experimentally observed dependences of the auxiliary heating efficiency on the different parameters (current, ion mass and energy, plasma column shift, magnetic field).

In Globus-M2 magnetic field and plasma current will be increased up to 1T and 500 kA. Modeling predicts decrease in fast ion losses and increase in the NBI efficiency. A new 60 keV injector is proposed. It will be more efficient in the high density regimes of the new machine.

References

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