Proposal and Attendance Form for NSTX Research Forum 2001

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Please write in the boxes below a one-page abstract of your proposal to be presented:

Title: MHD activity and transport of the energetic ions in high-β discharges of NSTX

Abstract:

Recently it has been shown theoretically that both transport of energetic ions in MHD-active plasmas of spherical tokamaks (ST) and the effect of the energetic ions on MHD activity in STs may considerably differ from those in conventional tokamaks [1,2]. The following issues important for the optimization of β in STs require the experimental and theoretical studies:

(i) Transport of energetic ions during relaxation oscillations. It is expected that the increase of β will enhance the transport of the trapped ions [1]. "Potatoes" may become stochastic and expelled from the plasma core [3].

(ii) Fishbone instability. According to theory of Ref. [2], trapped-particle-induced fishbone mode is stable in STs when β is high. Our preliminary analysis indicates that finite β tends to stabilize fishbones in plasmas with the energetic circulating ions, too [4].

(iii) Neoclassical tearing modes (NTM). It is expected that the squeezing of banana orbits in high-β discharges of STs will reduce the neoclassical polarization current. The energetic ions may affect the NTM, in particular, by leading to the pulsation of frequency [5].

[1] Ya.I. Kolesnichenko, V.V. Lutsenko, R.B. White, Yu.V. Yakovenko, Report PPPL-3484 (2000), submitted to Phys. Rev. Lett.
[2] Ya.I. Kolesnichenko, V.V. Lutsenko, V.S. Marchenko, Phys. Rev. Lett. **82** 3260 (1999).
[3] Ya.I. Kolesnichenko, V.V. Lutsenko, R.B. White, Yu.V. Yakovenko, Phys. Rev. Lett. **84** 2152 (2000).
[4] Ya.I. Kolesnichenko, V.S. Marchenko, R.B. White, "Low frequency fishbone mode induced by circulating particles in spherical tokamaks", in progress.
[5] V.S. Marchenko, V.V. Lutsenko, Phys. Plasmas, No. 2 (2001).

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