Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

**Fishbone instability and kink mode stabilization in nonperturbative simulations**[1] NIKOLAI GORELENKOV, PPPL, Princeton University — Two phenomena relying on the nonperturbative treatment of the fast ion terms are the fishbone instability and ideal kink mode stabilization. We employ the global NOVA-KN hybrid kinetic-MHD code to study the stability properties of these low-n solutions, such as the resonant (fishbone) and non-resonant (ideal) branches. The nonperturbative approach treats fast ions with their realistic drift orbits numerically by computing the moments of their perturbed pressure tensors in order to include them into the eigenmode equation. We introduce this technique together with the new conforming velocity space grid to efficiently evaluate the wave-particle interaction matrix. The used method results in both resonant and modified non-resonant branches, which are further studied to understand their stability properties in the presence of energetic ions [C.Z. Cheng, Phys. Reports, v.211,p.1 (1992)]. We include the destabilizing effects from energetic beam ions and alpha particles, which seem to be important for the studied instabilities. A model used for beam ion distribution is also presented. We study the properties of those branches in details. The applications to the modified burning ITER plasma are discussed to understand how far the stability region is in the operating space from its nominal values.

[1]This work is supported by US DOE contract no. DE-AC02-09CH11466.

Nikolai Gorelenkov
PPPL, Princeton University

Date submitted: 15 Jul 2011 Electronic form version 1.4