Abstract Submitted
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Equilibrium and convective stability of a plasma with interlinked toroidal and weak poloidal magnetic fields DMITRI RYUTOV, Lawrence Livermore National Laboratory — This study is related to the physics of a snowflake divertor [1]. One of its features is a large size of the zone of a very weak poloidal magnetic field in the divertor area. In this zone, the poloidal plasma beta (defined as a ratio of the plasma pressure to the pressure of a poloidal magnetic field) significantly exceeds unity. This brings up some interesting new features to the equilibrium and convective stability of the divertor plasma. It has recently been suggested [2] that convective instability can spread the heat over a larger area than normally assumed and "activate" all four divertor legs of a snowflake divertor, thereby significantly reducing the divertor heat load, especially during the ELM events. A quantitative analysis of the convective instability and/or loss of equilibrium at high poloidal betas will be presented and related to the heat flux reduction for a simplified geometry. Experimentally detectable signatures of plasma convection in the divertor zone will be considered. Work performed for U.S. DoE by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344

[1] D.D. Ryutov, Phys. Plas., 14, 064502, 2007;
[2] D.D. Ryutov et al., Contrib. Plasma Phys., to be published, 2012.

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