Log #DPP19-2019-001559

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Sorting Category: 06.17 (C)

Suppression of microtearing transport in a diamagnetic well induced at high-beta in the low-aspect-ratio Pegasus spherical torus[1] DAVID R. SMITH, M. BONGARD, R. FONCK, G. MCKEE, J. REUSCH, P. TERRY, Z. WILLIAMS, U. of Wisconsin - Madison, M.J. PUESCHEL, U. of Texas at Austin — A diamagnetic well and local minimum |B|region is readily accessed in high-β plasmas driven by local helicity injection in the $A \sim 1$ Pegasus ST. This magnetic topology may afford novel, favorable characteristics affecting turbulent transport. ∇B reversal on the low-field-side is stabilizing for drift waves, reduces the trapped particle fraction, and expands the parameter space for fast ion trapping. The high-β plasma, however, remains net-paramagnetic with near omnigeneity ($|B| \approx |B|(\psi)$) in the bad curvature region. Here, we report on the gyrokinetic stability of microtearing modes in the Pegasus minimum |B|regime. Multiple classes of microtearing instabilities at $k_y\rho_s \sim 0.1$-1 arise in the magnetic well region at $\psi_N \sim 0.3$-0.9. Collisionless high-k modes ($k_y\rho_s \approx 1$) with narrow parallel mode structures are destabilized at $\beta_{crit} \approx 3\%$, and collisional low-k modes ($k_y\rho_s \approx 0.3$) with extended parallel mode structures are destabilized at $\beta_{crit} \approx 12\%$. Nonlinear gyrokinetic simulations for a conventional monotonic |B|equilibrium show that the low-k modes produce electromagnetic electron thermal transport, but the transport and low-k instabilities are suppressed in the diamagnetic well configuration.

[1]Work supported by the US DOE grants DE-SC0001288, DE-FG02-96ER54375, and DE-FG02-04ER-54742.

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Date submitted: 03 Jul 2019 Electronic form version 1.4