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Creation of second order magnetic barrier inside chaos created by NTMs in the ASDEX UG HALIMA ALI, ALKESH PUNJABI, Hampton University — Understanding and stabilization of neoclassical tearing modes (NTM) in tokamaks is an important problem. For low temperature plasmas, tearing modes are believed to be mainly driven by current density gradient. For collisionless plasmas, even when plasma is stable to classical tearing modes, helical reduction in bootstrap current in O-point of an island can destabilize NTMs when an initial island is seeded by other global MHD instabilities or when microturbulence triggers the transition from a linear to nonlinear instability. The onset of NTMs leads to the most serious beta limit in ASDEX UG tokamak [O. Gubner et al 2005 NF **39** 1321]. The important NTMs in the ASDDEX UG are (m,n)=(3,2)+(4,3)+(1,1). Realistic parameterization of these NTMs and the safety factor in ASDEX UG are given in [O. Dumbrajs et al 2005 POP **12** 1107004]. We use a symplectic map in magnetic coordinates for the ASDEX UG to integrate field lines in presence of the NTMs. We add a second order control term [H. Ali and A. Punjabi 2007 PPCF **49** 1565] to this ASDEX UG field line Hamiltonian to create an invariant magnetic surface inside the chaos generated by the NTMs. The relative strength, robustness, and resilience of this barrier are studied to ascertain the most desirable noble barrier in the ASDEX UG with NTMs. We present preliminary results of this work, and discuss its implications with regard to magnetic transport barriers for increasing strength of magnetic perturbations. This work is supported by the grants DE-FG02-01ER54624 and DE-FG02-04ER54793.

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