Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Scaling of the stochastic broadening from low mn, high mn, and peeling-ballooning magnetic perturbations in the DIII-D tokamak MICHAEL ZHAO, ALKESH PUNJABI, HALIMA ALI, Hampton University — The equilibrium EFIT data for the DIII-D shot 115467 is used to construct the equilibrium generating function for magnetic field line trajectories in the DIII-D tokamak in natural canonical coordinates [A. Punjabi, and H. Ali, Phys. Plasmas **15**, 122502 (2008)]. A canonical transformation is used to construct an area-preserving map for field line trajectories in the natural canonical coordinates in the DIII-D. Maps in natural canonical coordinates have the advantage that natural canonical coordinates can be inverted to calculate real space coordinates (R,Z,ϕ), and there is no problem in crossing the separatrix. This is not possible for magnetic coordinates [O. Kerwin, A. Punjabi, and H. Ali, Phys. Plasmas **15**, 072504 (2008)]. This map is applied to calculate stochastic broadening from the low mn (m,n)=(1,1)+(1,-1); high mn (m,n)=(4,1)+(3,1); and the peeling-ballooning (m,n)=(40,10)+(30,10) magnetic perturbations. In all three cases, the scaling of the widths of stochastic layer near the X-point in the principal plane of the DIII-D deviates at most by 6% from the $1/2$ power Boozer-Rechester scaling [A. Boozer, and A. Rechester, *Phys. Fluids* **21**, 682 (1978)]. This work is supported by US Department of Energy grants DE-FG02-07ER54937, DE-FG02-01ER54624 and DE-FG02-04ER54793.

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Date submitted: 29 Jun 2009 Electronic form version 1.4