

Abstract Submitted  
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**Diffusion of chaotic field lines in tokamaks** HALIMA ALI, ALKESH PUNJABI, Center for Fusion Research & Training, Hampton University, Hampton, VA 23668 — An important instability for the destruction of magnetic surfaces in tokamaks due to island overlapping is the tearing modes. Magnetic fields perturbed by tearing modes are given by the sinusoidal form  $B_r = -\frac{1}{rR} \sum_{m,n} b_m^n \sin(m\theta - n\varphi)$ . The sinusoidal nature of perturbation creates islands structure near resonant surfaces. In this work, we consider two modes,  $(m_1, n_1)$  and  $(m_2, n_2)$  that interact with each other, leading to two chains of islands, called primary islands. We use a previously derived Hamiltonian map, the  $\psi - \theta$  map, with and without higher order control terms to study the diffusion of chaotic field lines. We will present and discuss the results of this work, and discuss its implications with regard to magnetic transport barriers for a fixed  $q$ -profile and increasing strength of magnetic perturbations. This work is done under the DOE grant number DE-FG02-01ER54624. 1. A. Punjabi *et al*, *Phys. Rev. Lett.*, **69**, 3322 (1992). 2. H. Ali, A. Punjabi, and A. Boozer, *Int. J. Comp. Num. Ana. Applications* **6**, 17 (2005).

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