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Magnetic Field Line Stickiness in Tokamaks CAROLINE G.L. MARTINS, University of Texas at Austin, Department of Physics, Institute for Fusion Studies, Austin - TX 78712, USA, MARISA ROBERTO, Departamento de Fisica, Instituto Tecnologico de Aeronautica, Sao Jose dos Campos, SP, 12228-900, Brazil, IBERE L. CALDAS, Universidade de Sao Paulo, Instituto de Fisica, Sao Paulo, SP, 05315-970, Brazil, PHILIP J. MORRISON, University of Texas at Austin, Department of Physics, Institute for Fusion Studies, Austin - TX 78712, USA — We analyze a Hamiltonian model with five wire loops that delineate magnetic surfaces of tokamaks with poloidal divertors. Non-axisymmetric magnetic perturbations are added by external coils, similar to the correction coils that have been installed or designed in present tokamaks. We obtain the footprints and deposition patterns on the divertor plates, and, additionally, we show that while chaotic lines escape to the divertor plates, some of them are trapped, for many toroidal turns, in complex structures around magnetic islands, giving rise to evidence of stickiness characteristic of chaotic Hamiltonian systems [Caroline G. L. Martins et al. IEEE Transactions on Plasma Science (accepted), 2014]. In order to identify sticky structures, we perform a finite time rotation number calculation [J. D. Szezech Jr. et al. Phys. Lett. A, 377, 452, 2013]. Finally, we introduce a random collisional term to the field line mapping to investigate the effect of particle collisions on stickiness. The results indicate that the reported trapping may affect the transport in present tokamaks [Caroline G. L. Martins et al. Physics of Plasmas (Submitted), 2014].

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