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Calculation of the safety factor and homoclinic tangles of the separatrix for the Symmetric Quartic Map[1] DANIELLE BALDWIN, BRIA ANDREWS, HALIMA ALI, ALKESH PUNJABI, Hampton University — The equilibrium generating function for the Symmetric Quartic Map (SQM) in natural canonical coordinates is constructed [M. Jones et al, Phys. Plasmas 16, 042511 (2009), A. Punjabi, Nucl. Fus. 49, 115020 (2009)]. The coefficients in the generating function are chosen to control the safety factor profile and to set the height and width of the equilibrium separatrix to be same as in the Simple Map [A. Punjabi, A. Verma, and A. Boozer, Phys. Rev. Lett. 69, 3322 (1992)]. The equilibrium separatrix of the SQM is advanced forward and backward in canonical time using the SQM [4]. When the forward and backward advanced separatrix manifolds meet in a fixed poloidal plane, they intersect and form homoclinic tangles to preserve the symplectic invariant [A. Punjabi and A. Boozer, Phys. Lett. A 378, 2410 (2014)]. The map parameter of the SQM is used to include the effects of magnetic asymmetries. The safety factor profile and the homoclinic tangles of the separatrix of the SQM for different values of the map parameter will be presented. The separatrix of the simple map is open and unbounded; while the separatrix of the SQM is closed and compact. The purpose is to study what role the topology of the separatrix plays in the homoclinic tangle in single-null divertor tokamaks. This work is supported by grants DE-FG02-01ER54624, DE-FG02-04ER54793, and DE-FG02-07ER54937.

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