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Role of Bumpy Fields on Single Particle Orbit of near Quasi-Helically Symmetric Stellarators*

J. Seol and C. C. Hegna
Department of Engineering Physics University of Wisconsin
Madison, WI 53706-1609

We investigate the role of symmetry breaking effect on single particle orbit in near helically symmetric stellarators. In particular, the effect of a mirror term is included in the analysis of trapped particle orbits. By means of the longitudinal adiabatic invariant along the banana orbit, solutions of the banana drift equation can be evaluated. From these solutions, we find that all trapped particle orbits are determined by circular traces where B_{min} is constant in the plasma cross section. These particle orbits reside on these surfaces regardless of pitch angle and are determined by initial position and the B_{min} contour. Trapped particles are confined as long as the particles' circular trace does not intersect the plasma-vacuum boundary. We also will investigate transition properties between the trapped particle banana drift orbits. These transitions occur when the magnetic well along the trace is sufficiently shallow. Progress towards a quantitative estimate of these transitions will be described.

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