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Statistics of magnetic moment jumps in collision-less mirror machines[1] CHRISTOPHER FERRI, Princeton Univ, ALEXANDER GLASSER, Princeton Plasma Physics Laboratory (PPPL), ALAN GLASSER, Fusion Theory and Computation, Inc, SAMUEL COHEN, Princeton Plasma Physics Laboratory (PPPL) — The magnetic moment adiabatic invariant μ has long been known to be "conserved to all orders," and is taken to be constant in many models used to predict plasma behavior. However, in high magnetic curvature or weak field systems, the lack of a proper small parameter renders μ conservation very weak. For example, since the 1950's it has been known that in magnetic mirrors, many charged particles experience jumps in μ as they cross the axial midplane. Such changes in μ affect mirror confinement. The detailed statistics of these jumps determine whether confinement increases or decreases. We present extensive studies, performed with a Hamiltonian code, of μ jumps. The jump in μ is measured by comparing μ values at successive axial turning points. Using statistical methods, we characterize these μ jumps and examine their distributions and trends, segregated by initial phase-space position, and speculate on the effects that such jumps in μ might have on the population of trapped mirror particles. We further consider the harmonic behavior of (zeroth-order) μ near the axial turning points.

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