

Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Conservation of Magnetic Moment for Charged Particle Motion in a Time-Dependent Uniform Magnetic Field¹ S.A. YI, Cornell University/SULI, R.C. DAVIDSON, H. QIN, Princeton Plasma Physics Laboratory, Princeton University — The adiabatic magnetic moment invariant for the motion of a charged particle in a spatially uniform, time-dependent magnetic field $B(t)$ is studied numerically. The robustness of the magnetic moment invariant $\mu = mv_{\perp}^2/2B$ is explored for slowly varying and rapidly varying magnetic field $B(t)$, for a charged particle moving in a long solenoid with time-varying current. The effects of various functional forms of $B(t)$ on the conservation of the adiabatic magnetic moment invariant are examined numerically. In the case of a slowly varying magnetic field, where the time-scale of the change in the magnetic field is much larger than the particle gyroperiod, it is shown numerically that the adiabatic magnetic moment μ is asymptotic to a recently discovered exact magnetic moment invariant M , which is conserved even for rapidly varying magnetic fields [1, 2]. [1] R.C. Davidson and H. Qin, *Physics of Intense Charged Particle Beams in High Energy Accelerators* (World Scientific, 2001). [2] H. Qin and R.C. Davidson, An Exact Magnetic Moment Invariant of Charged Gyromotion, submitted for publication (2005).

¹Research supported by the U.S. Department of Energy under contract No. DE-AC02-76CH03073.

S.A. Yi
Cornell University/SULI

Date submitted: 21 Jul 2005

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