Reduction of the Guiding-Center Dynamics: Magnetic Momentum & Bounce-Average

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We reduce the dynamics of particles in a static (inhomogeneous) magnetic field, by building two constants of motions. They are independant of the Hamiltonian but non-commuting between each other. So in general, this system (with 3 degrees of freedom) is still non-integrable. The constants of motion are related to the "Magnetic Momentum" and the "Bounce-Average". This reduced "Guiding-Center" dynamics is a first step towards the full reduction of the Maxwell-Vlasov dynamics. The retro-action of the plasma on the fields has to be treated by Hamiltonian Perturbation Methods, into a "Gyro-Center" dynamics.