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Geometric Phase of the Gyromotion in Adiabatic Magnetic Field¹ JIAN LIU, Peking University, HONG QIN, Princeton University — In magnetic field changing slowly with time and/or space, the gyromotion of charged particles is quasi-periodic. When describing it by gyrocenter coordinate, the gyrophase turns out to have an additional part, called geometric gyrophase, besides the normal dynamical phase. It is an example of the geometric phase which has many important applications in different branches of physics. Its name comes from elegant geometric meaning and deep geometric origin, the noncommutativity of rotation operations. Its value depends only on the evolving path in a parameter space. If the magnetic field returns to its initial value after a loop in the parameter space, the value is equal to the solid angle spanned by the loop. Compared with the Berry phase of electron's spin wave function in the same adiabatic field, the similarities and distinctions reveal the similar geometric nature in different physical laws. The study on geometric gyrophase clarifies that we cannot avoid problems such as the definition of gyrophase and the gauge choice for local frames, when applying the gyrokinetics in varying magnetic fields.

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