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The spin dynamics in the strong spin-orbit coupling regime-A collective Rabi oscillation¹ XIN LIU, XIONG-JUN LIU, JAIRO SINOVA, Department of Physics, Texas A&M University, College Station, TX 77843-4242, USA — We study the spin evolution in a high-mobility two dimensional electron gas (2DEG) with generic spin-orbit interactions(SOI). A fully understanding of the D'yakonov-Perel's(DP) mechanism is presented by using the microscopic linear response theory from the diffusive to the ballistic regime. We derive a set of spin dynamical equations which capture the characters of the purely exponential and damped oscillatory spin evolution modes in different spin-orbit coupling(SOC) regimes. It is shown that the oscillatory spin dynamics appear when the electron life time is larger than the half of the spin precession time due to the SOI. The Rabi oscillation between two spin bands is the physical origination of the damped oscillatory modes.

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