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The Dyakonov-Perel spin dynamics in the strong spin-orbit coupling regime XIN LIU, XIONG-JUN LIU, JAIRO SINOVA, Department of Physics, Texas A&M University, College, JAIRO SINOVA'S GROUP SPINTRONICS AND NANOELECTRONICS RSEARCH TEAM — 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 the different spin-orbit coupling (SOC) regime. 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. We also proposed a way to measure the SOC strength and the electron life time from the spin oscillatory mode.

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