The *g*-factor of conduction electron in Rashba system

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In 2-dimensional electron system (2DES), the inversion asymmetry of structure induces Rashba effect, and this is the key factor of spin modulation in Datta-Das spin FET. On the one hand, since Rashba spin-orbit coupling (SOC) is able to be understood in terms of spin splitting energy (Δ_{SO}) and effective magnetic field (B_R), the *g*-factor of conduction electron which mediates electric and magnetic properties of carrier is closely related to Rashba SOC. In this research, we propose the method to obtain the *g*-factor of conduction electron in 2DES using Shubnikov-de Haas (SdH) oscillation, involved with Rashba SOC.

Generally, SdH oscillation is measured in perpendicular magnetic field, and affected by intrinsic Rashba SOC which makes beats in conductance oscillation.Then, Rashba parameter is determined with the period of the beats in oscillation, and obtained parameter is 6.41×10^{-12} eV-m. Rashba SOC,meanwhile, is able to be modified with in-plane magnetic field, so it changes the period of beats and Rashba parameter. To manipulate the Rashba SOC, we applied in-plane magnetic field in addition to perpendicular field. While perpendicular field induces the conductance oscillation, constant in-plane field modifies the Rashba SOC. Also we can write the relation between modified Rashba parameter (α) and total magnetic field as$\alpha = (g\mu_B/2k_F)(B_R + B_{\text{in-plane}})$. Consequently, *g*-factor is estimated from the equation, with the value of -13.

We observed the *g*-factor of conduction electron in 2DES by applying in-plane magnetic field in measurement of SdH oscillation. This experience gives the simple method to determine *g*-factor in strong Rashba SOC.