Determination of g-factor andShubnikov-de Haas Oscillation

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The magnetic field dependence of resistance is very interesting topic in electronics because of its diversity of origin. As one of these, the Shubnikov-de Haas (SdH) oscillation is well known phenomenon and it has the same mechanism as quantum Hall effect which is formation of the Landau level and the Zeeman spin splitting. Since spin-orbit coupling (SOC) can be estimated by observing beat patterns of SdH oscillation in 2-dimensional electron gas (2DEG), the oscillationis one of the most important phenomena in spin transport system.

The SdH oscillation also gives the *g*-factor which characterizes the magnetic moment of carrier. In previous research, J. Nitta *et al*. obtained the g-factor of quantum well layer from fixed angle dependence ofSdH oscillation [1]. In our research, on the other hand, *g*-factor of InAs2DEGwas estimated fromfixed transverse magnetic field dependence of Rashba SOC parameter. To observe Rashba SOC parameter, perpendicular magnetic field is necessary to induce conductance fluctuation and beat nodes. Then applied transverse field interacts with Rashba SOC and derives shift of beat nodes.

The Rashba SOC parameter obtained without transverse field was 6.41×10^{-12} $eV\cdot$m and can be converted into effective magnetic field with the equation, $B_R=(2\alpha k_F)/(g\mu_B)$. When transverse field is applied, this equationis rewritten by sum of transverse and effective magnetic field and Rashba SOC parameter varies with *g*-factor. Comparing experimentally obtained SOC parameter and equation, we extracted the *g*-factor of ~13.

[1] J. Nitta, Y. Lin T. Akazaki, and T. Koga, Applied Physics Letters, 83, 4565 (2003).