Magnetic Quantum Oscillations of the Anomalous Hall Resistance in the Systems with Spontaneous Spin Polarization of Donor Electrons in Hybridized States

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The anomalous Hall effect observed in mercury selenide crystals with impurities of transitional elements[1] has been explained by the appearance of the magnetization current contribution $\sigma = c|e|(\partial M_0/\partial\zeta)$ into the Hall component of the conductivity tensor (M_0 is the spontaneous magnetization of the electron system, ζ is the chemical potential). At low temperatures and in high magnetic fields quantum oscillations of spontaneous magnetization are detected. In this report a calculation of oscillating dependence of $(\partial M_0/\partial\zeta)$ on magnetic field for a system of electrons in hybridized impurity states is presented. The oscillations have large amplitude and are described by the quantum oscillations of the density of states with the Fermi energy. The form of the oscillations was calculated taking into account the dependence of chemical potential and the energy level spin splitting on the magnetic field.

References:

[1] Lonchakov A.T., Okulov V.I., Govorkova T.E., Andriichuk M.D., Paranchich L.D., JETP Letters, 96, 405 (2012).