Effective gauge field theory of spintronics

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Spintronics phenomena are discussed based on the concept of effective gauge field [1]. Effective gauge fields arise from structures of localized spin (magnetization) and couple to spin current of conduction electron. The adiabatic component of the gauge field gives rise to spin Berry's phase, topological Hall effect and spin motive force, while nonadiabatic components are essential for spin-transfer torque [2], Dzyalosinski-Moriya interaction [3] and spin pumping [4] effects by inducing nonequilibrium spin accumulation. Electromagnetic cross correlation effects and anomalous optical properties are discussed based on effective Lagrangian for conventional electromagnetic field and spin gauge field [5, 6].

References

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