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Mobility of Charge Carriers and Magnetoresistance of Dilute Magnetic Semiconduc.[1] MICHAEL FOYGEL, JAMES NIGGEMANN, ANDRE PETUKHOV, SDSMT, SDSMT TEAM — We studied electrical transport in dilute magnetic semiconductors, which is determined by scattering of free carriers by localized magnetic moments. In our calculations of the scattering time and the mobility of the majority and minority-spin carriers we took into account both the effects of thermal spin fluctuations and of built-in spatial disorder of the magnetic atoms. These effects are responsible for the magnetic-field dependence of the mobility of the charge carriers. The application of the external magnetic field suppresses the thermodynamic spin fluctuations thus increasing the mobility and promoting negative magnetoresistance. Depending on the type of the carriers and on parameters of the impurity potential, scattering by built-in spatial fluctuations of the atomic spins increases or decreases with the magnetic field. The latter effect is due to the change in the magnitude of the random local Zeeman splitting with the magnetic field. Under certain circumstances it may promote positive magnetoresistance. We discuss the role of the above effects on mobility and magnetoresistance of semiconductors where magnetic impurities are electrically active or neutral.

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