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Interfering effects of localized electronic and nuclear spins on carrier transport in organic semiconductors KEVSER SAHIN TIRAS, YIFEI WANG, NICHOLAS J. HARMON, MARKUS WOHLGENANNT, MICHAEL E. FLATTE, University of Iowa — Spin and magnetic-field effects in organic semiconductors have been intensively studied over the recent years. An interaction between electronic and nuclear spins (hyperfine interaction) is responsible for these magnetic-field effects. In organic semiconductor solid-state devices, a variety of such magnetic field effects have been observed. For example, magnetoresistance effects may be used for magnetic random-access-memory (MRAM). We experimentally and theoretically study the influence of radical doping on the transport characteristics in a conjugated polymer MEH-PPV in terms of magneto conductance (MC) and power conversion efficiency (PCE). We find that for initial doping the radical spins relax the mobile spins, thus reducing the magnetic field effect on magnetoresistance. For intermediate doping a dopant spin interacts with only one component of the radical pair. In this region, the MC is independent of the doping level and is reduced to half its undoped value. For further doping a galvinoxyl molecule interacts with both carriers that form a radical pair, the MC is completely quenched. We will also discuss the effect of galvinoxyl doping on photovoltaic PCE in the different regimes.

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