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Organic magnetoresistance near saturation: mesoscopic effects in small devices[1] ROBERT ROUNDY, ZEEV VARDENY, MIKHAIL RAIKH, University of Utah — In organic light emitting diodes with small area the current may be dominated by a finite number, N of sites in which the electron-hole recombination occurs. As a result, averaging over the hyperfine magnetic fields, $\mathbf{b}_h$, that are generated in these sites by the environment nuclei is incomplete. This creates a random (*mesoscopic*) current component, $\delta I(\mathbf{B})$, at field $\mathbf{B}$ having relative magnitude $\sim N^{-1/2}$. We demonstrate that mesoscopic fluctuations develop at fields $|\mathbf{B}| \gg |\mathbf{b}_h|$, where the average magnetoresistance is near saturation. These fluctuations originate from the slow beating between S and T_0 states of the recombining e-h spin pair-partners. We identify the most relevant processes responsible for the current fluctuations as due to anomalously slow beatings that develop in sparse e-h polaron pairs at sites for which the $\mathbf{b}_h$ projections on the external field direction almost coincide. To find the characteristic period $\Delta\mathbf{B}$ of the fluctuations, we calculate the correlator $K(\mathbf{B}, \Delta\mathbf{B}) = \langle \delta I\left(\mathbf{B} - \Delta\mathbf{B}\right) \delta I\left(\mathbf{B} + \Delta\mathbf{B}\right)\rangle$.

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