Motivated by recent experiment*, we develop a theory of organic magnetoresistance (OMAR) in the presence of a resonant ac drive. To this end, we perform a thorough analysis of the dynamics of ac-driven electron-hole polaron pair in magnetic field, which is a sum of external and random hyperfine fields. Resonant ac drive affects the OMAR by modifying the singlet content of the eigenmodes. This, in turn, leads to the change of recombination rate, and ultimately, to the change of the spin-blocking which controls the current. Our analysis demonstrates that, upon increasing the drive amplitude, the blocking eigenmodes of the triplet type acquire a singlet admixture and become unblocking. Most surprisingly, the opposite process goes in parallel: new blocking modes emerge from nonblocking precursors as the drive increases. These emergent blocking modes are similar to subradiant modes in the Dicke effect. A nontrivial evolution of eigenmodes translates into a nontrivial behavior of OMAR with the amplitude of the ac drive: it is initially linear, then passes through a maximum, drops down, and finally saturates.


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