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Magnetoresistance detected spin collectivity in organic light emitting diodes HANS MALISSA, DAVID P WATERS, GAJADHAR JOSHI, MARZIEH KAVAND, MARK E LIMES, Department of Physics and Astronomy, University of Utah, PAUL L BURN, Centre for Organic Photonics Electronics, School of Chemistry Molecular Biosciences, The University of Queensland, JOHN M LUPTON, Department of Physics and Astronomy, University of Utah and Institut fuer Experimentelle und Angewandte Physik, Universitaet Regensburg, CHRISTOPH BOEHME, Department of Physics and Astronomy, University of Utah — Organic magnetoresistance (OMAR) typically refers to the significant change in the conductivity of thin layers of organic semiconductors at low static magnetic fields (< 10 mT). When radio frequency (rf) radiation is applied to an organic semiconductor under bipolar injection, and in the presence of small magnetic fields B, magnetic resonance can occur, which is observed as a change of the OMAR effect [Baker et al., Nat. Commun. 3, 898 (2012)]. When B and the resonant driving field are stronger than local hyperfine fields, an ultrastrong coupling regime emerges, which is marked by collective spin effects analogous to the optical Dicke effect [Roundy and Raikh, Phys. Rev. B 88, 125206 (2013)]. Experimentally, this collective behavior of spins can be probed in the steady state OMAR of organic light-emitting diodes (OLEDs) at room temperature by observation of a sign reversal of the OMAR change under rf irradiation. Furthermore, in the presence of strong driving fields, an ac Zeeman effect can be observed through OMAR [Waters et al., Nat. Phys. 11, 910 (2015)], a unique window to observe room temperature macroscopic spin quantum coherence.

Hans Malissa
Department of Physics and Astronomy, University of Utah

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