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Coexistence of CDW, SDW and FM induced by particle-hole asymmetry and metamagnetic transitions

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Within a multicomponent theory that takes into consideration on the same footing the CDW, SDW and FM order parameters, we study their eventual coexistence and competition with parallel SDW and FM polarizations. We show that particle-hole asymmetry mixes the above orders generalizing the excitonic ferromagnetism picture. It is never possible to have two of them without the third one. In a particle-hole asymmetric system they arise simultaneously in a weakly first order transition. For systems that are close to particle-hole symmetry, a magnetic field may induce at low temperatures first order metamagnetic transitions that can be double, firstly from CDW or SDW to CDW+SDW+FM and then from CDW+SDW+FM to only FM. These results may explain longstanding puzzles like the origin of the weakly first order character of the SDW transition in Bechgaard salts, similar weakly first order CDW transitions in TMTTF-TCNQ salts as well as more recent puzzles like secondary transitions close to the first order metamagnetic transition in bilayered ruthenites and URu_2Si_2.

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