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Theory of Valley-Density Wave and Hidden Order in Iron-Pnictides[1] JIAN KANG, ZLATKO TESANOVIC, Institute for Quantum Matter, Johns Hopkins University, Baltimore, MD 21218 — In the limit of perfect nesting, the physics of iron-pnictides is governed by the density wave formation at the zone-edge vector **M**. At high energies, various spin- (SDW), charge- (CDW), orbital/pocket- (PDW) density waves, and their mutually orthogonal linear combinations, all appear equally likely, unified within the unitary order parameter of the $U(4) \times U(4)$ symmetry. Nesting imperfections and low-energy interactions reduce this symmetry to that of real materials. Nevertheless, the generic ground state preserves a distinct signature of its highly symmetric origins: an SDW along one axis of the square iron lattice is predicted to *coexist* with a PDW along the perpendicular axis, accompanied by a modulated pattern of weak charge currents on inter-iron bonds. This "hidden" order induces the tetragonal-orthorhombic structural transition in our theory, naturally insures $T_s \geq T_N$, and leads to other observable consequences.

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