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Spin density wave order, topological order, and Fermi surface reconstruction SUBIR SACHDEV, Harvard Univ, EREZ BERG, The Weizmann Institute of Science, Rehovot, 76100, Israel, SHUBHAYU CHATTERJEE, Department of Physics, Harvard University, Cambridge MA 02138, USA, YONI SCHATTNER, The Weizmann Institute of Science, Rehovot, 76100, Israel — In the conventional theory of density wave ordering in metals, the onset of spin density wave (SDW) order co-incides with the reconstruction of the Fermi surfaces into small 'pockets'. We present models which display this transition, while also displaying an alternative route between these phases via an intermediate phase with topological order, no broken symmetry, and pocket Fermi surfaces. The models involve coupling emergent gauge fields to a fractionalized SDW order, but retain the canonical electron operator in the underlying Hamiltonian. We establish an intimate connection between the suppression of certain defects in the SDW order, and the presence of Fermi surface sizes distinct from the Luttinger value in Fermi liquids. We discuss the relevance of such models to the physics of the hole-doped cuprates near optimal doping.

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