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Superconductivity on the brink of spin-charge order in doped honeycomb bilayer[1] OSKAR VAFEK, JAMES MURRAY, VLADIMIR CVETKOVIC, NHMFL and Florida State University — Using a controlled weak-coupling renormalization group approach, we establish the mechanism of unconventional superconductivity in the vicinity of spin or charge ordered excitonic states for the case of electrons on the Bernal stacked bilayer honeycomb lattice. With one electron per site this system exhibits nearly parabolically touching conduction and valence bands. Such a state is unstable towards a spontaneous symmetry breaking, and repulsive interactions favor excitonic order, such as a charge nematic and/or a layer antiferromagnet. We find that upon adding charge carriers to the system, the excitonic order is suppressed, and unconventional superconductivity appears in its place, before it is replaced by a Fermi liquid. We focus on firmly establishing this phenomenon using the RG formalism within an idealized model with parabolic touching.

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Oskar Vafek
NHMFL and Florida State University

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