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Charge-order in the underdoped cuprates: a window into the normal state DEBANJAN CHOWDHURY, SUBIR SACHDEV, Harvard University — Recent experiments in the underdoped regime of the hole-doped cuprates have found evidence for an incommensurate charge density wave state. We present an analysis of the charge ordering instabilities in a metal with antiferromagnetic correlations, where the electronic excitations are coupled to the fractionalized excitations of a quantum fluctuating antiferromagnet on the square lattice [1]. The resulting charge density wave state emerging out of such a fractionalized Fermi-liquid (FL*) is remarkably similar to the one observed in experiments on a number of different families of the cuprates [2]. Our results show that the observed charge density wave appears as a low-energy instability of a fractionalized metallic state linked to the proximity to an antiferromagnetic insulator, and the pseudogap regime can be described by such a metal at least over intermediate length and energy scales. We also describe the transition from a Fermi-liquid with a large Fermi-surface to a FL* around optimal doping via a Higgs-transition of a SU(2) gauge-theory. The implications of such Higgs criticality in two-dimensional metals on the physics of strange metal will be discussed.

[1] D. Chowdhury and S. Sachdev, arXiv:1409.5430.
[2] K. Fujita et al., PNAS 111, E3026 (2014)

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