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**Unification of bosonic and fermionic $Z_2$ spin liquids on a rectangular lattice** SHUBHAYU CHATTERJEE, JULIA STEINBERG, SUBIR SACHDEV, Harvard University — Recent theories [1] have postulated the presence of a fractionalized Fermi liquid ($FL^*$) in the pseudogap metal phase of cuprates. The $FL^*$ phase can be described as a spin liquid co-existing with fermionic charge carrying quasiparticles. Underdoped cuprates also show a variety of competing orders, including nematic order which reduce the $C_4$ symmetry of the square lattice to $C_2$. Motivated by this, we classify mean-field bosonic spin liquids on a rectangular lattice using projective symmetry groups (PSG) [2], and find equivalent descriptions in terms of fermionic partons [3]. In particular, we find a fermionic spin liquid ansatz corresponding to a bosonic $Z_2$ spin liquid with favorable mean field energy [4]. The fermionic ansatz might be useful to investigate the transition from a $FL^*$ to a fermi liquid. [1]. Density-wave instabilities of fractionalized Fermi liquids: D. Chowdhury and S. Sachdev, PRB 90, 245136 (2014) [2] Quantum orders and symmetric spin liquids: XG Wen, PRB 65 (16), 165113 (2002) [3] Unification of bosonic and fermionic theories of spin liquids on the kagome lattice: Y-M. Lu, G. Y. Cho, A. Vishwanath, arXiv:1403.0575 [4] Large-N expansion for frustrated quantum antiferromagnets: N. Read and S. Sachdev, PRL 66, 1773 (1991)

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