

Abstract Submitted  
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**Controlled evidence for phase separation in the fermionic 2D Hubbard model**<sup>1</sup> FEDOR ŠIMKOVIC, EVGENY KOZIK, King's College London, UK, BORIS SVISTUNOV, NIKOLAY PROKOF'EV, UMass, Amherst, US, YOUJIN DENG, USTC Hefei, China — In this study we inspect the repulsive two-dimensional fermionic Hubbard model at doping values  $0.6 \leq n \leq 1$  and moderate interaction strength  $U = 4$  by means of the Bold Diagrammatic Monte Carlo <sup>2</sup>(DiagMC) and Determinant Diagrammatic Monte Carlo <sup>3</sup>(DDMC). We use a stability condition for the inverse compressibility to prove in a controlled and unbiased way the existence of a first order phase transition and intermediate phase separated region between the  $d_{x^2-y^2}$ -wave superfluid at densities  $n < 0.8$  and the anti-ferromagnetic phase at half filling ( $n = 1.0$ ). The critical density of  $n_c \sim 0.82$  obtained via Maxwell construction is in good correspondence with the region of densities where magnetic fluctuations become significant at  $U = 4$ .

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<sup>2</sup>Y. Deng et al. Europhysics Letters **110(5)**, 57001, (2015)

<sup>3</sup>E. Burowski et al. New Journal of Physics **8**, 153, (2006)

Fedor Šimkovic  
King's College London

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