

Doping dependence of the oxygen K-edge in the cuprates

Philip Phillips and Mark Jarrell
UIUC, LSU
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Measurement of x-ray absorption spectra of overdoped high-temperature cuprate superconductors: Inapplicability of the single-band Hubbard model

D.C. Peets,^{1,*} D.G. Hawthorn,² K.M. Shen,³ Young-June Kim,⁴ D.S. Ellis,⁴ H. Zhang,⁴ Seiki Komiya,⁵ Yoichi Ando,⁶ G.A. Sawatzky,^{7,8} Ruixing Liang,^{7,8} D.A. Bonn,^{7,8} and W.N. Hardy^{7,8}

¹*Department of Physics, Graduate School of Science, Kyoto University, Kyoto, Japan 606-8502*

²*Department of Physics & Astronomy, University of Waterloo,
200 University Ave. W, Waterloo, ON, Canada N2L 3G1*

³*Department of Physics, Cornell University, Ithaca, New York, USA 14853*

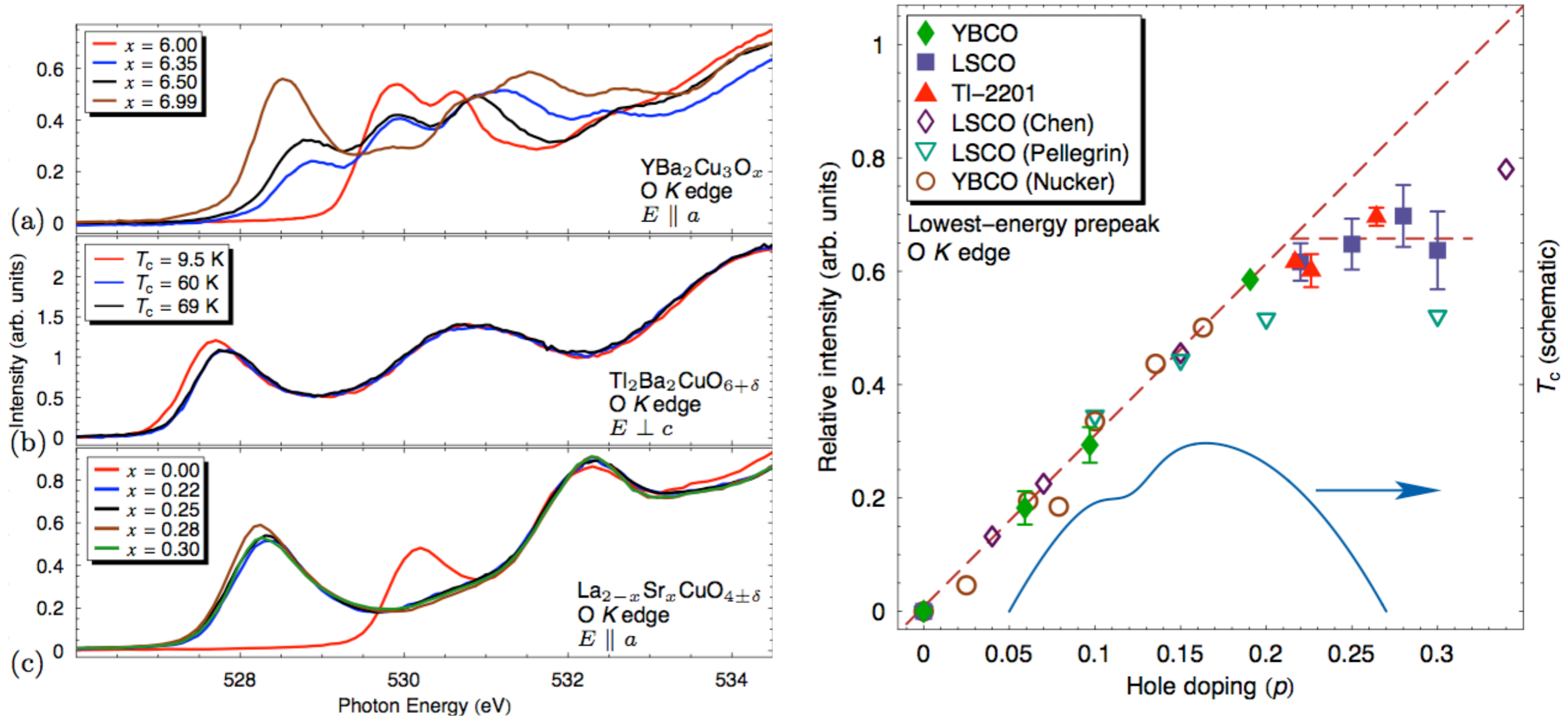
⁴*Department of Physics, University of Toronto, 60 St. George St., Toronto, ON, Canada M5S 1A7*

⁵*Central Research Institute of Electric Power Industry,
2-6-1 Nagasaka, Yokosuka, Kanagawa, Japan 240-0196*

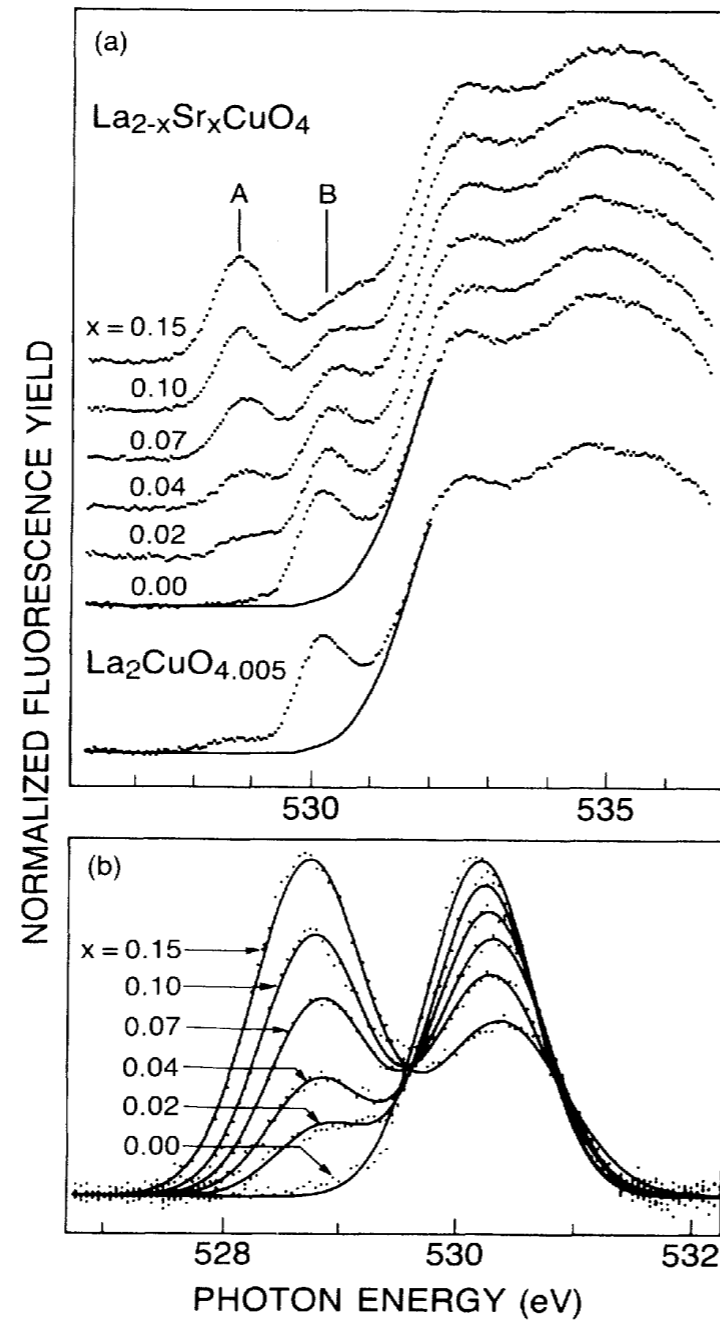
⁶*Institute of Scientific and Industrial Research, Osaka University, 8-1 Mihogaoka, Ibaraki, Osaka, Japan 567-0047*

⁷*Department of Physics & Astronomy, University of British Columbia,
6224 Agricultural Rd., Vancouver, BC, Canada V6T 1Z1*

⁸*Canadian Institute for Advanced Research, Toronto, Canada*



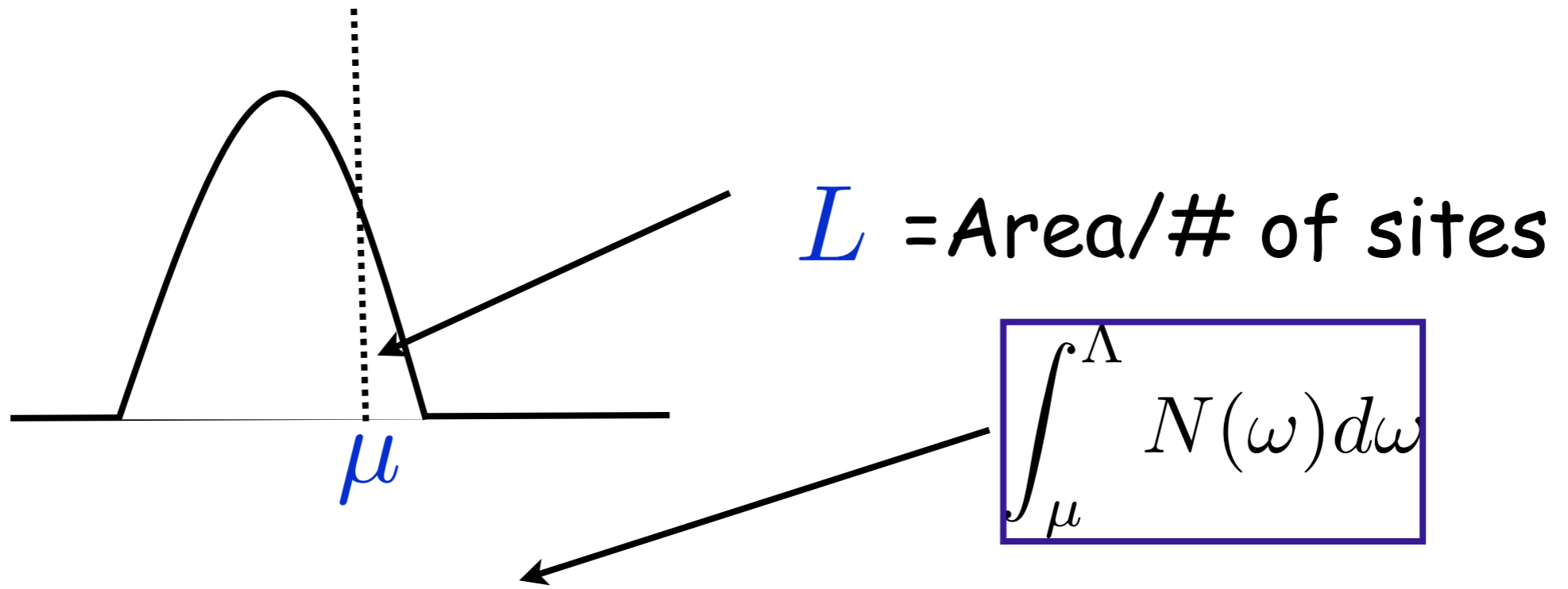
C.T. Chen,
Batlogg,
et al. 1990



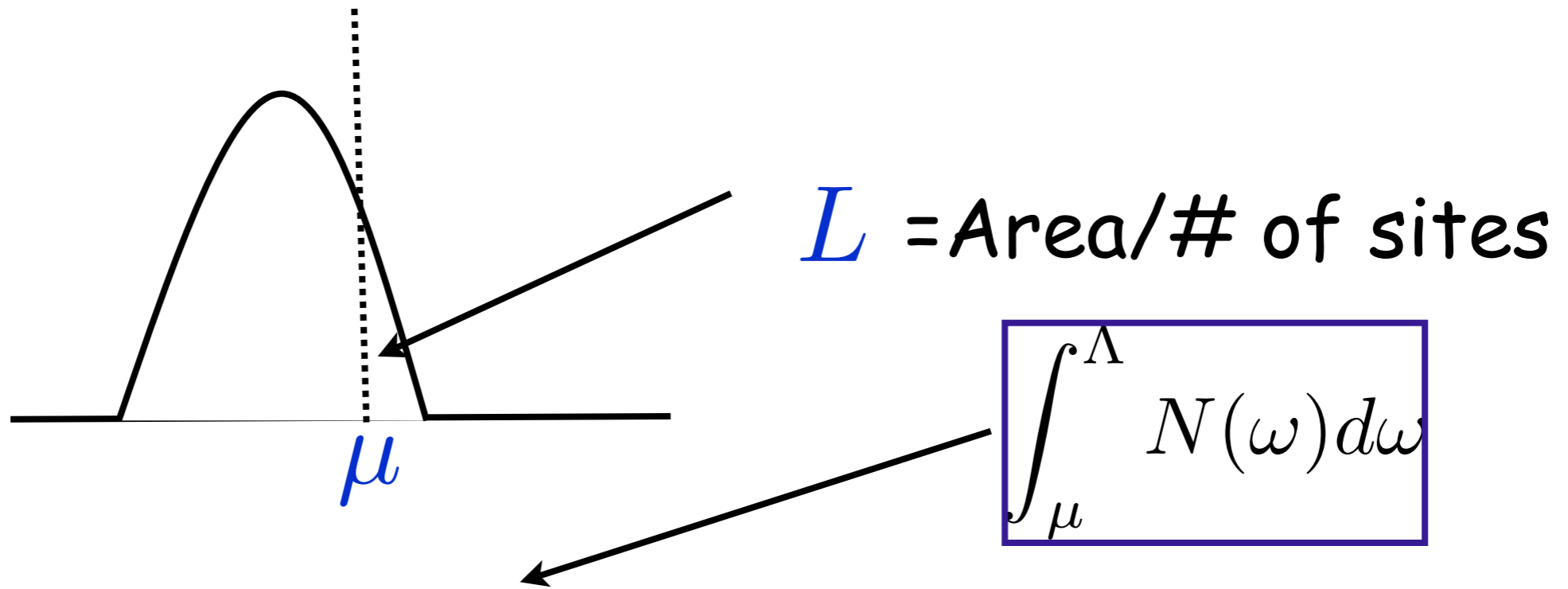
No saturation

Is the claim of saturation correct?

What is being measured?



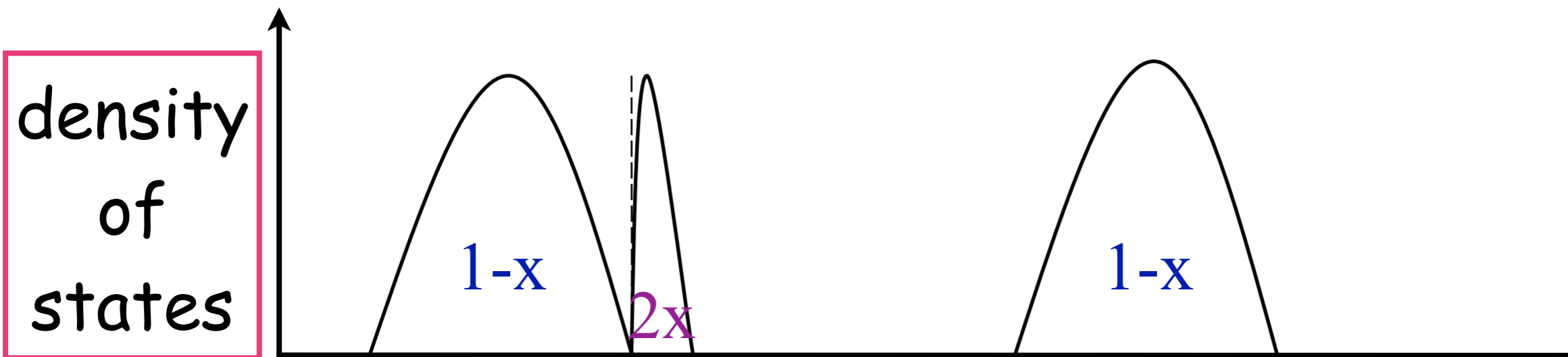
$L = \#$ of single-particle
addition states (qp)



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In no model does L saturate!!

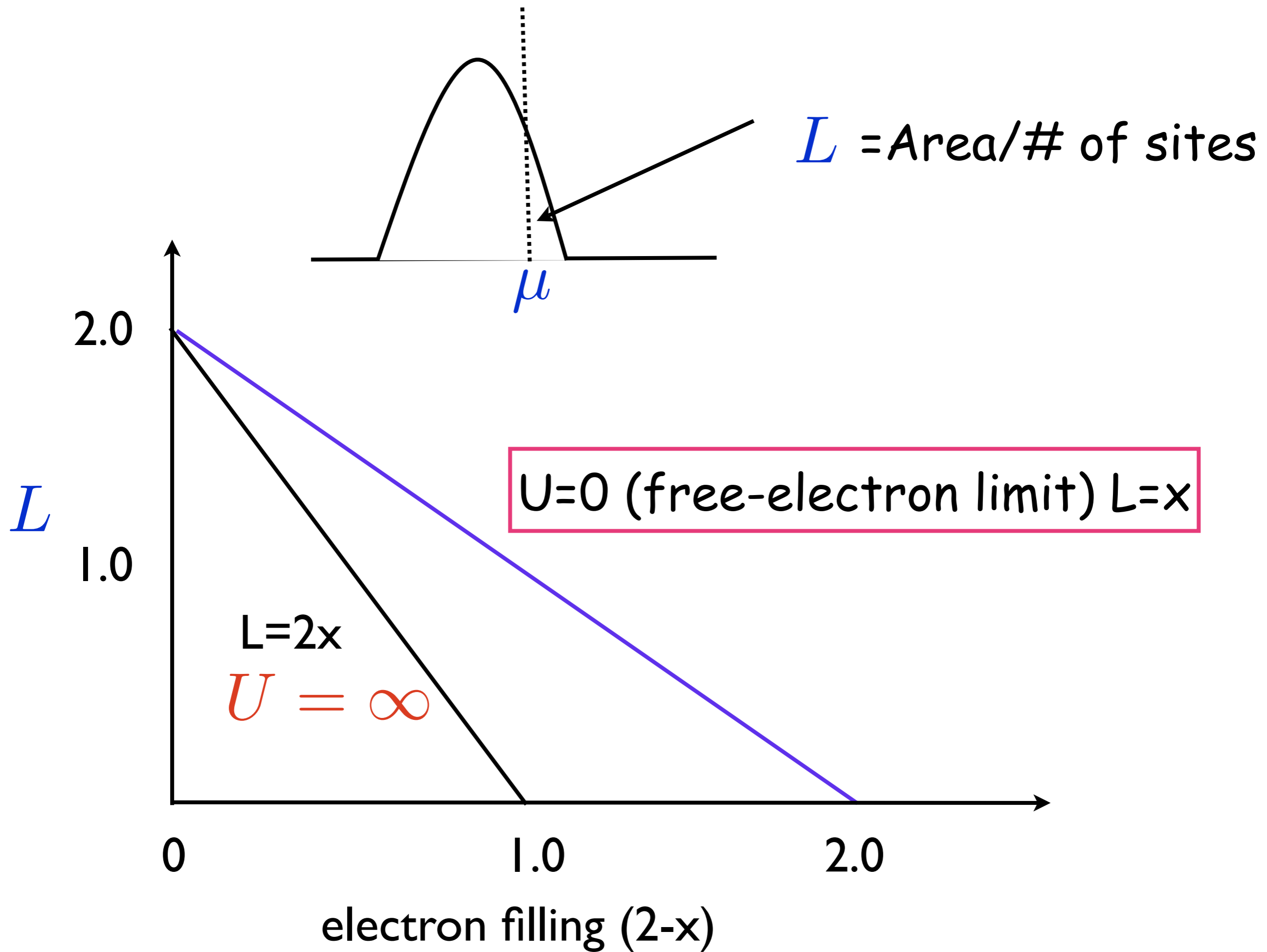
Hubbard model atomic limit: x holes

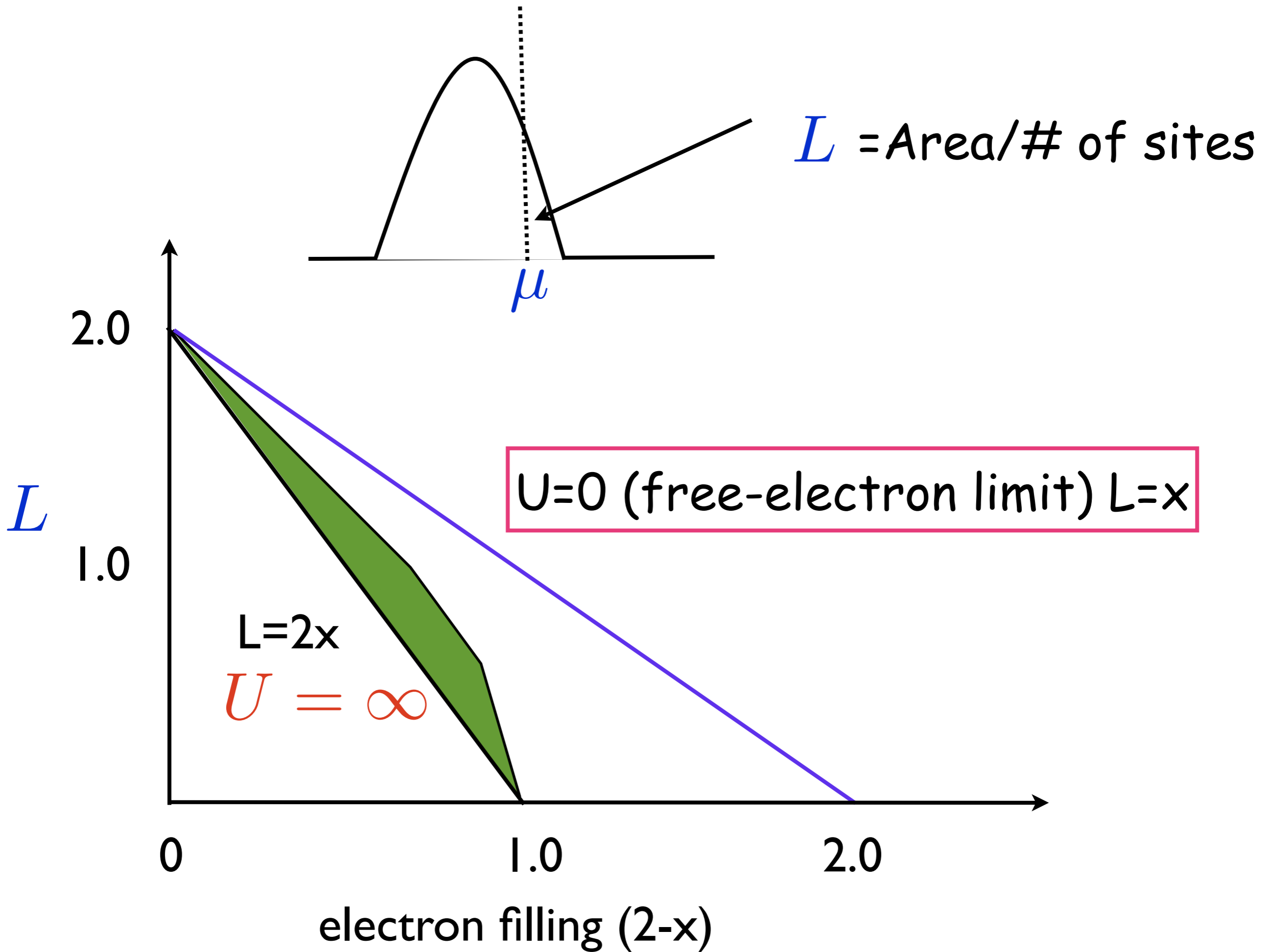


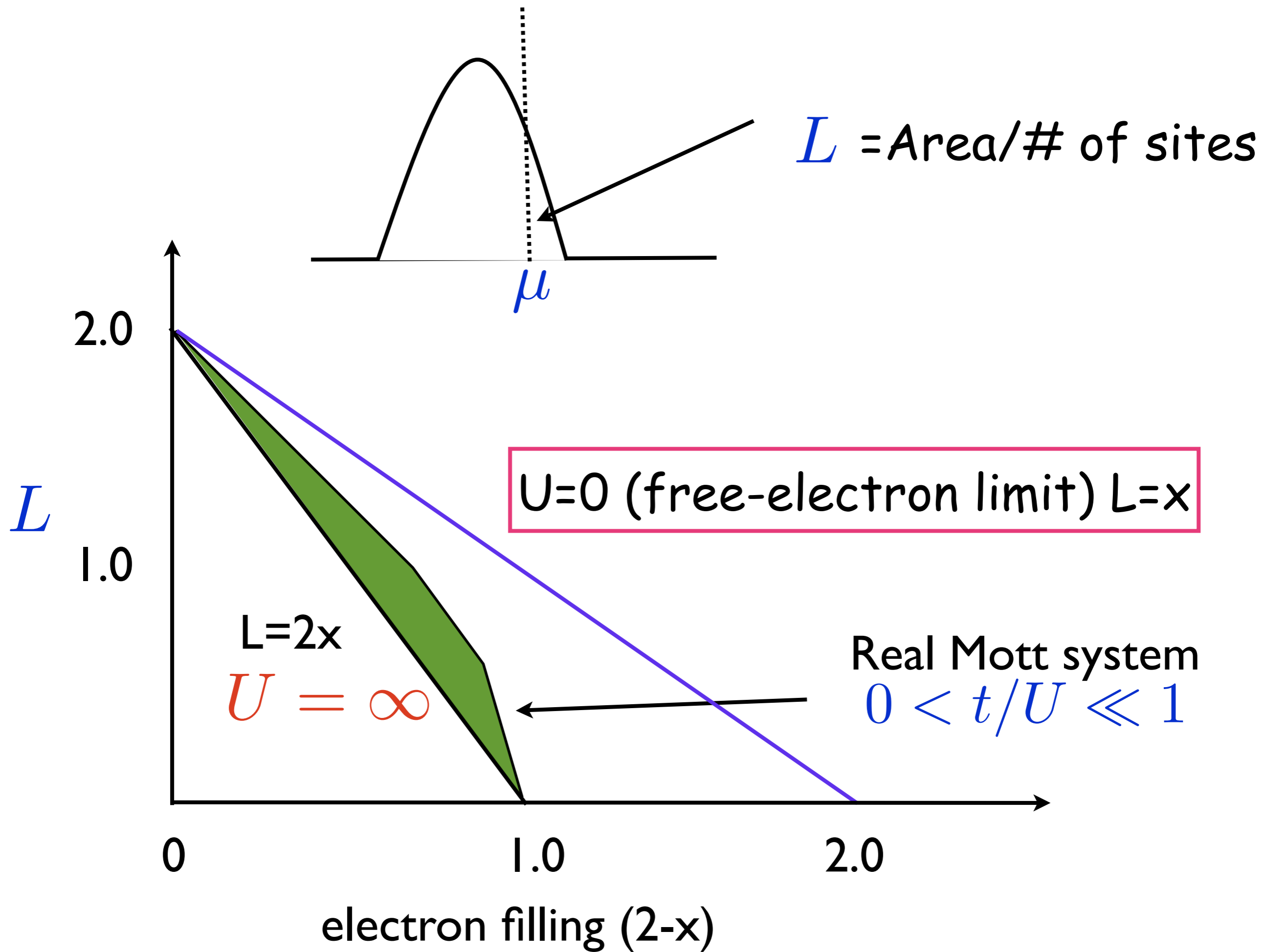
PES ϵ_F

IPES

$$G_{\sigma}(\omega, k) = \frac{\frac{1}{2}(1+x)}{\omega - \mu + \frac{U}{2}} + \frac{\frac{1}{2}(1-x)}{\omega - \mu - \frac{U}{2}}$$

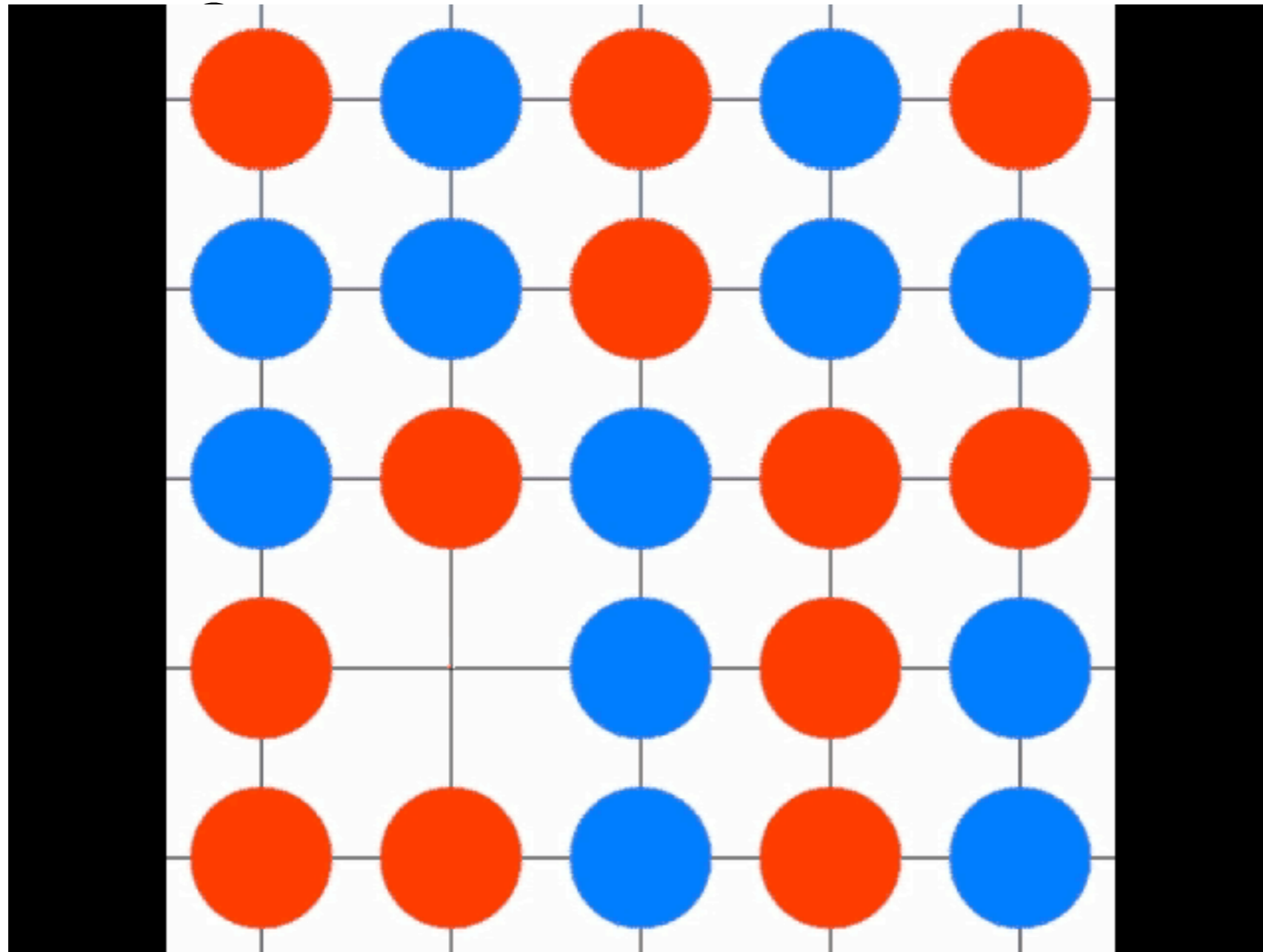






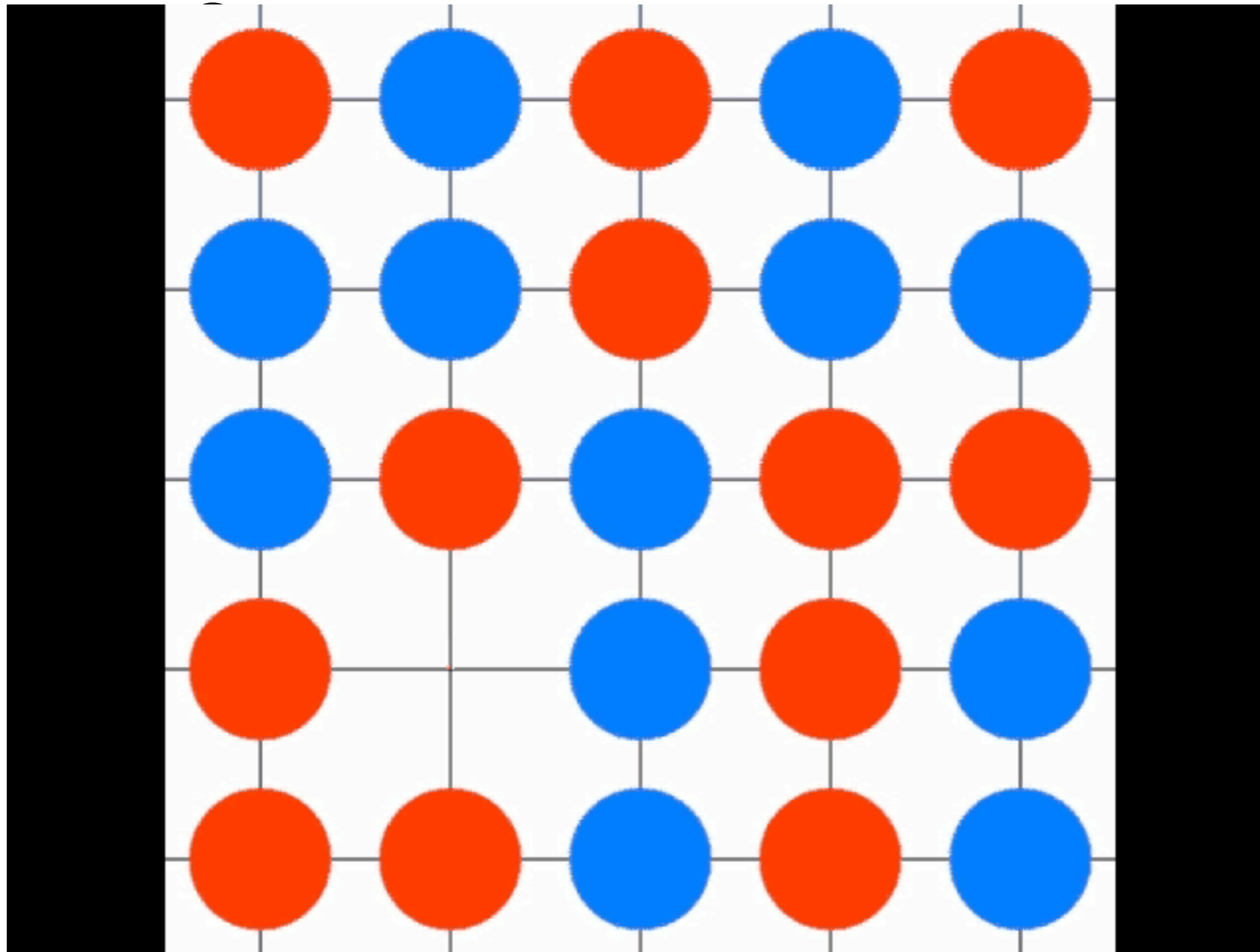
quantum Mottness: U finite

$$U \gg t$$



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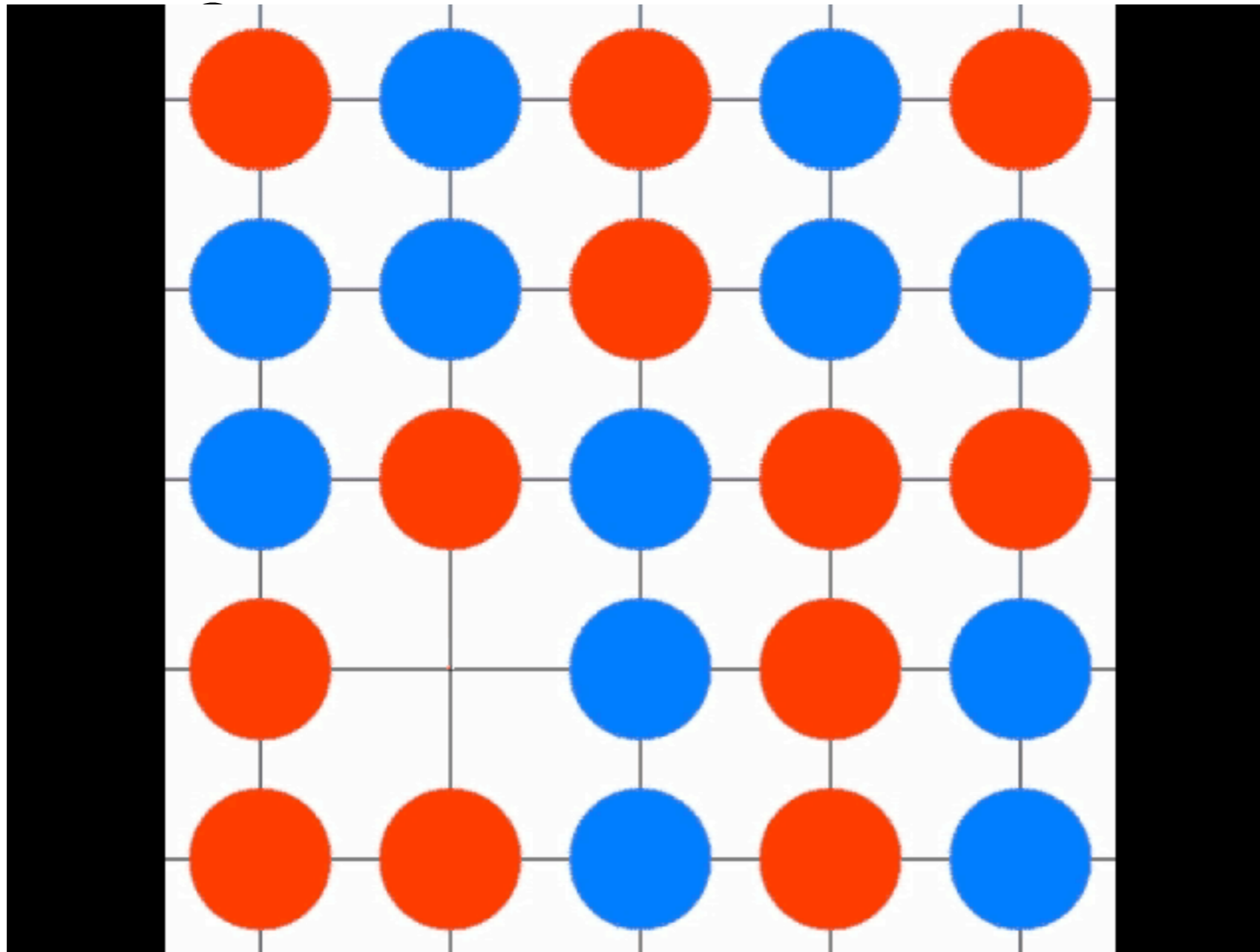
$$U \gg t$$



double occupancy in ground state!!

quantum Mottness: U finite

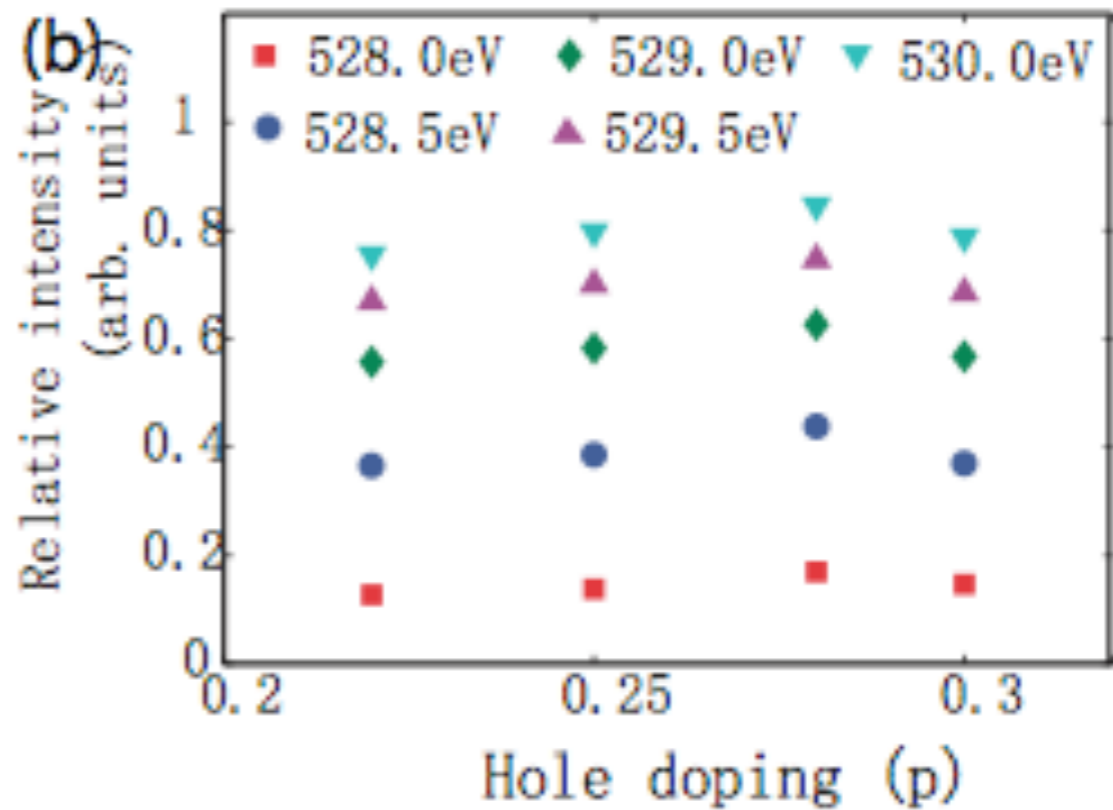
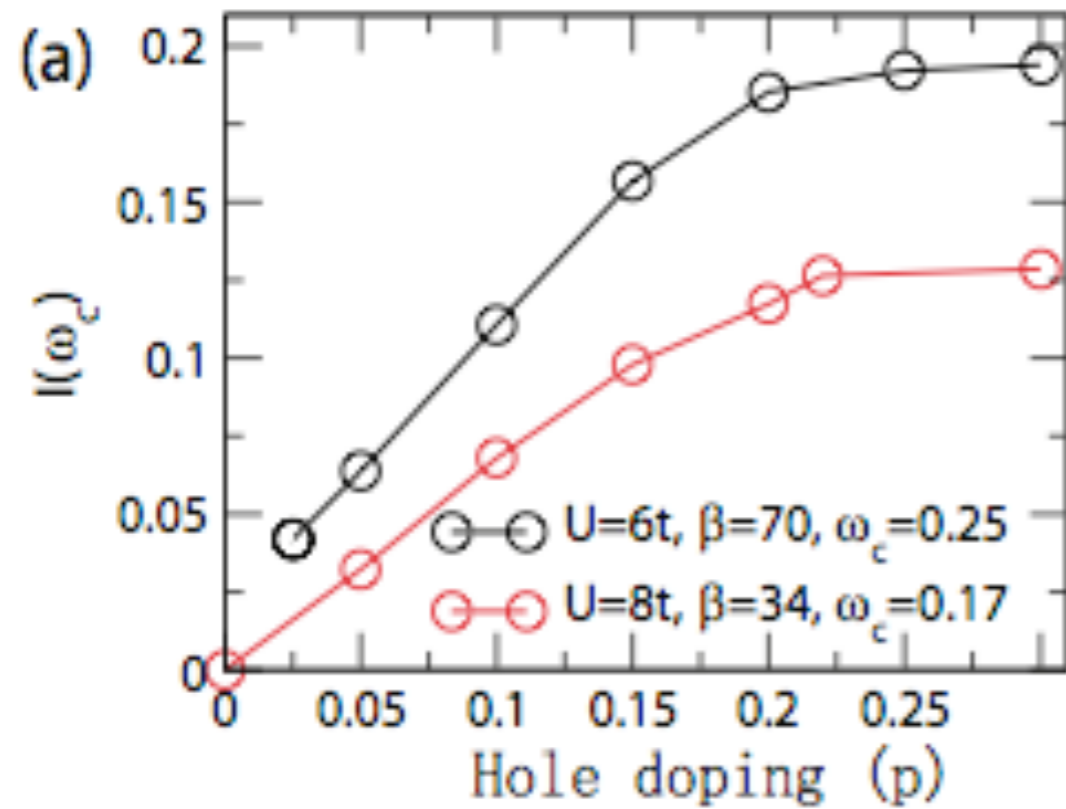
$$U \gg t$$



double occupancy in ground state!!

$$W_{\text{PES}} > 1 + x$$

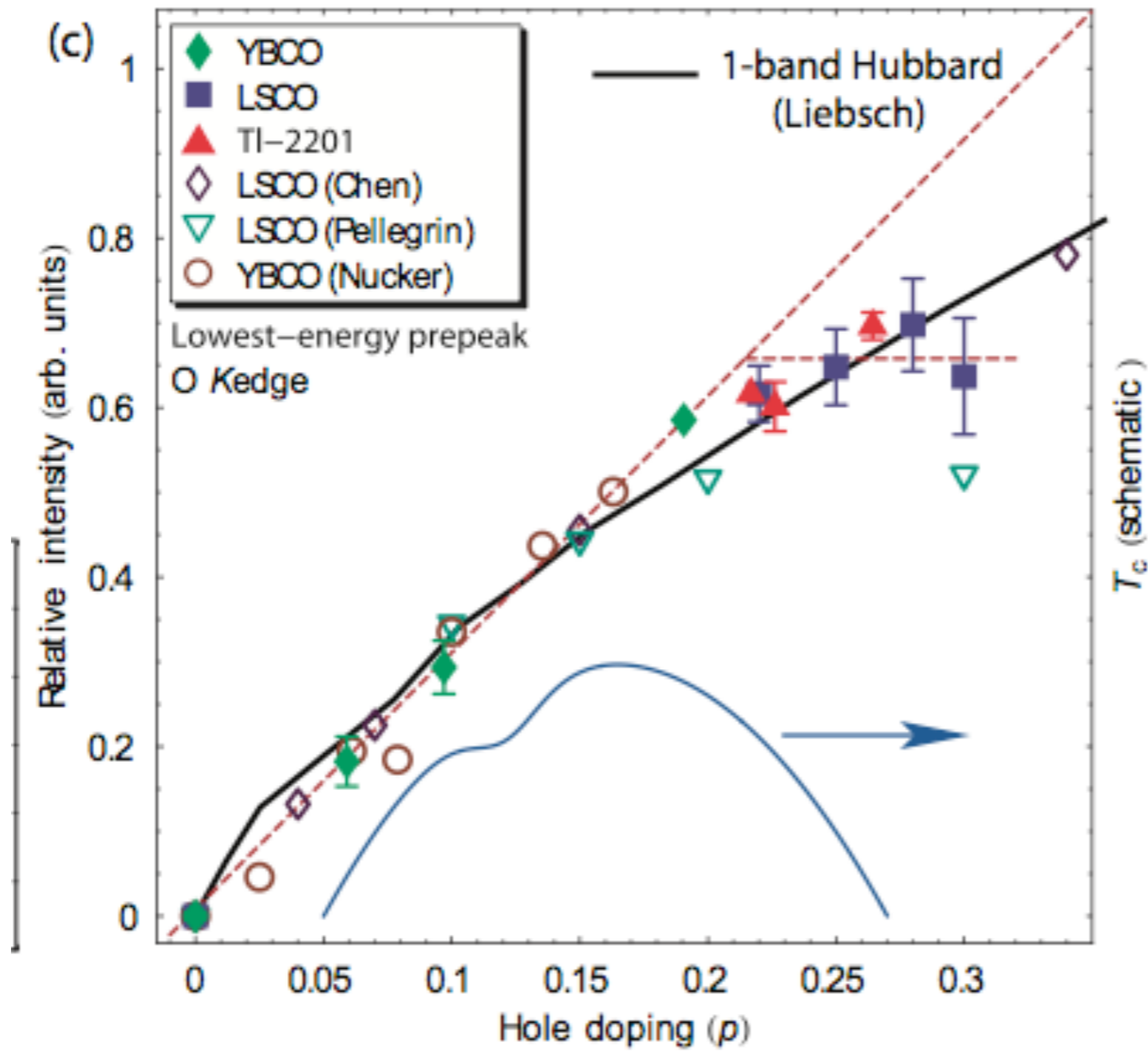
Is this just a cut-of problem?



No

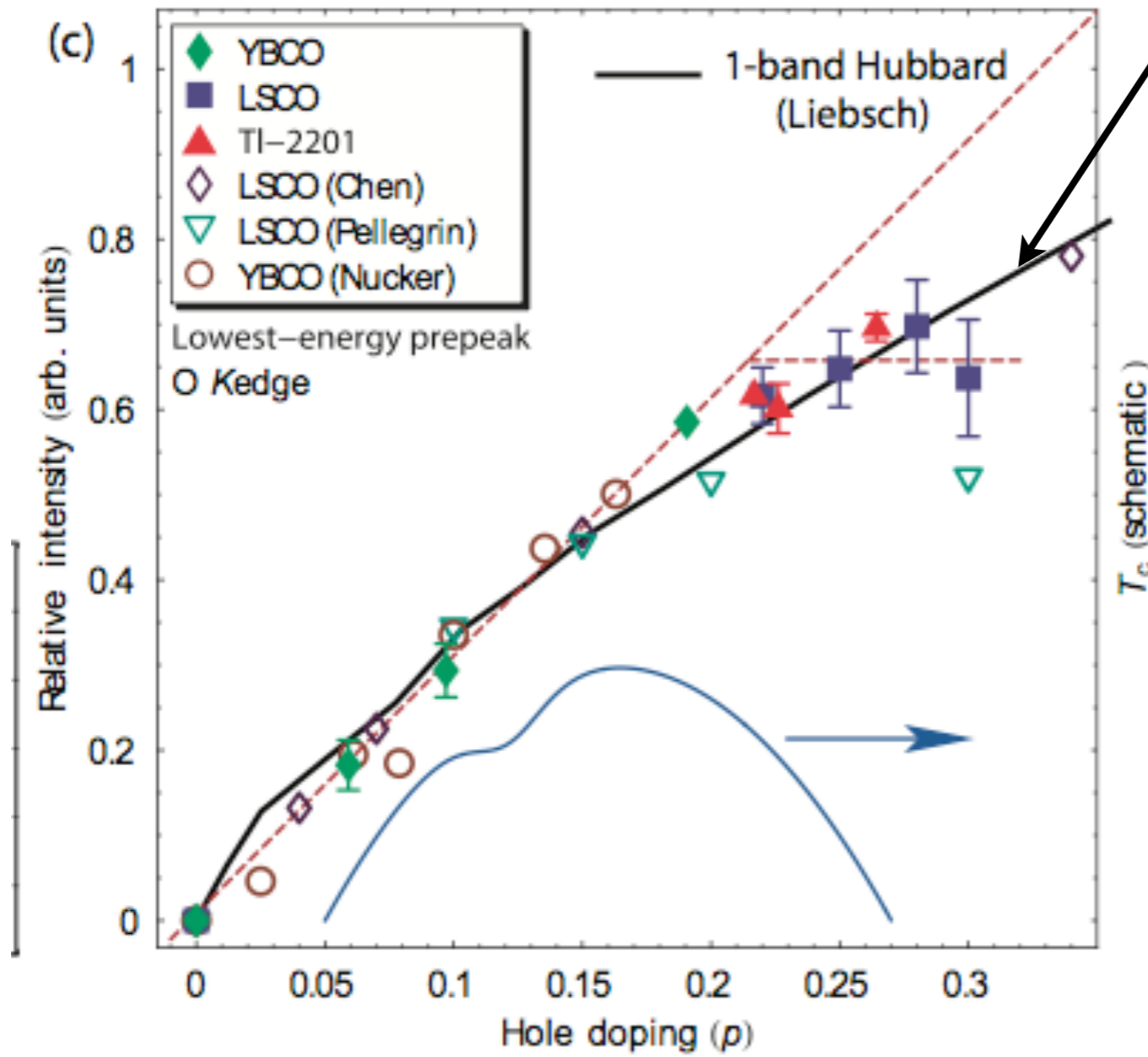
Why not compare experiments with I-band Hubbard model?

Why not compare experiments with 1-band Hubbard model?



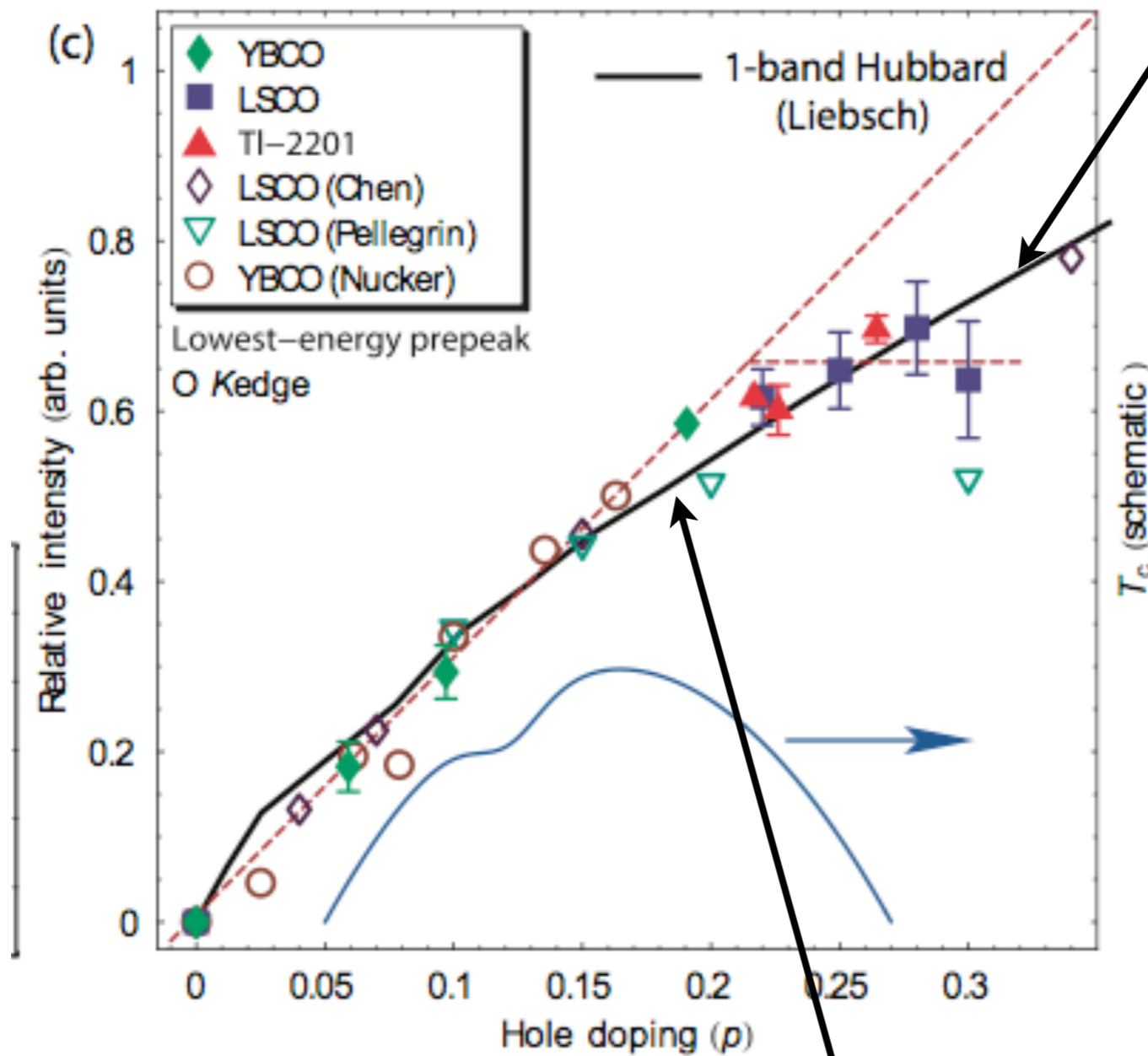
Why not compare experiments with I-band Hubbard model?

I-band Hubbard model



Why not compare experiments with I-band Hubbard model?

I-band Hubbard model



Slope change when dynamical SW diminishes.

No saturation just a slope change where
dynamical spectral weight transfer diminishes as in one-
band Hubbard model