

# Doping dependence of the oxygen K-edge in the cuprates

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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

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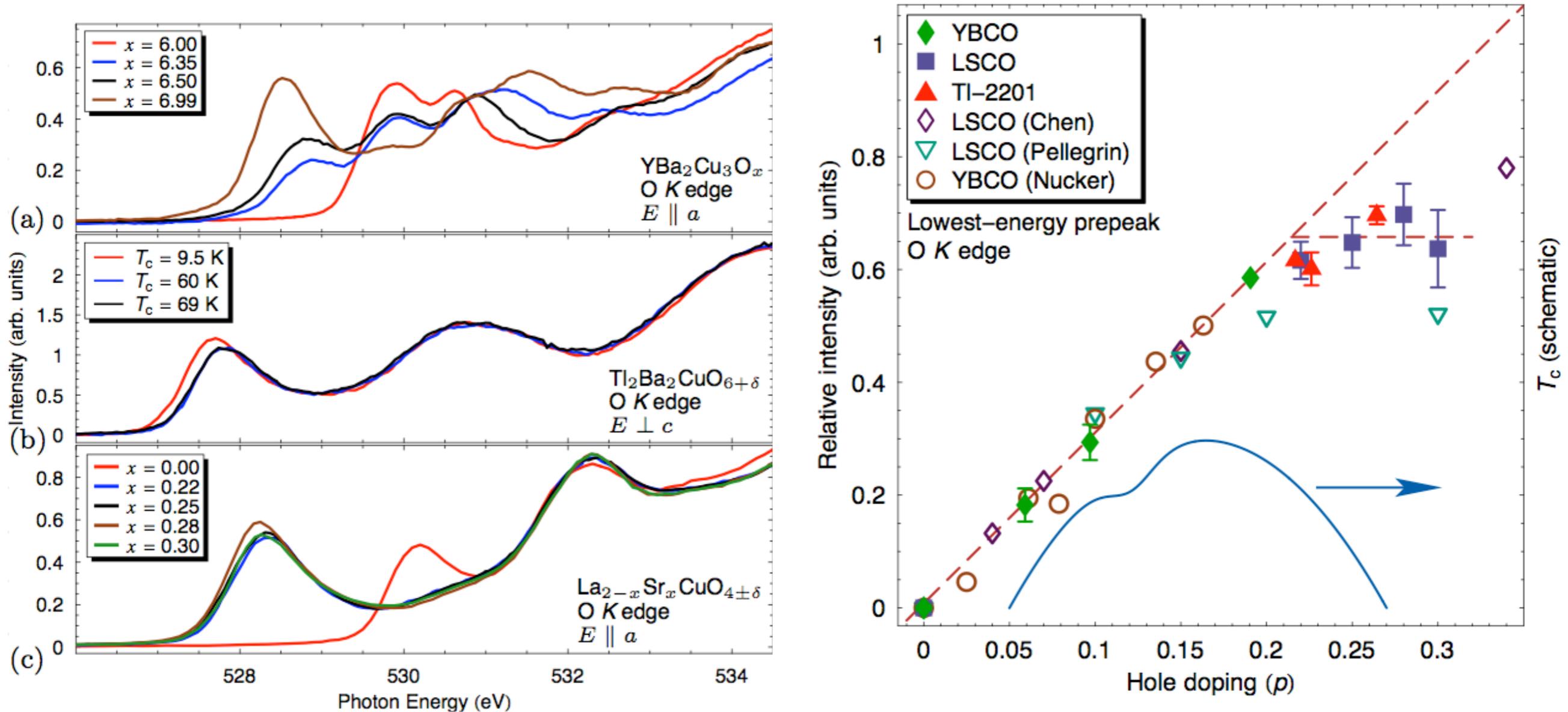
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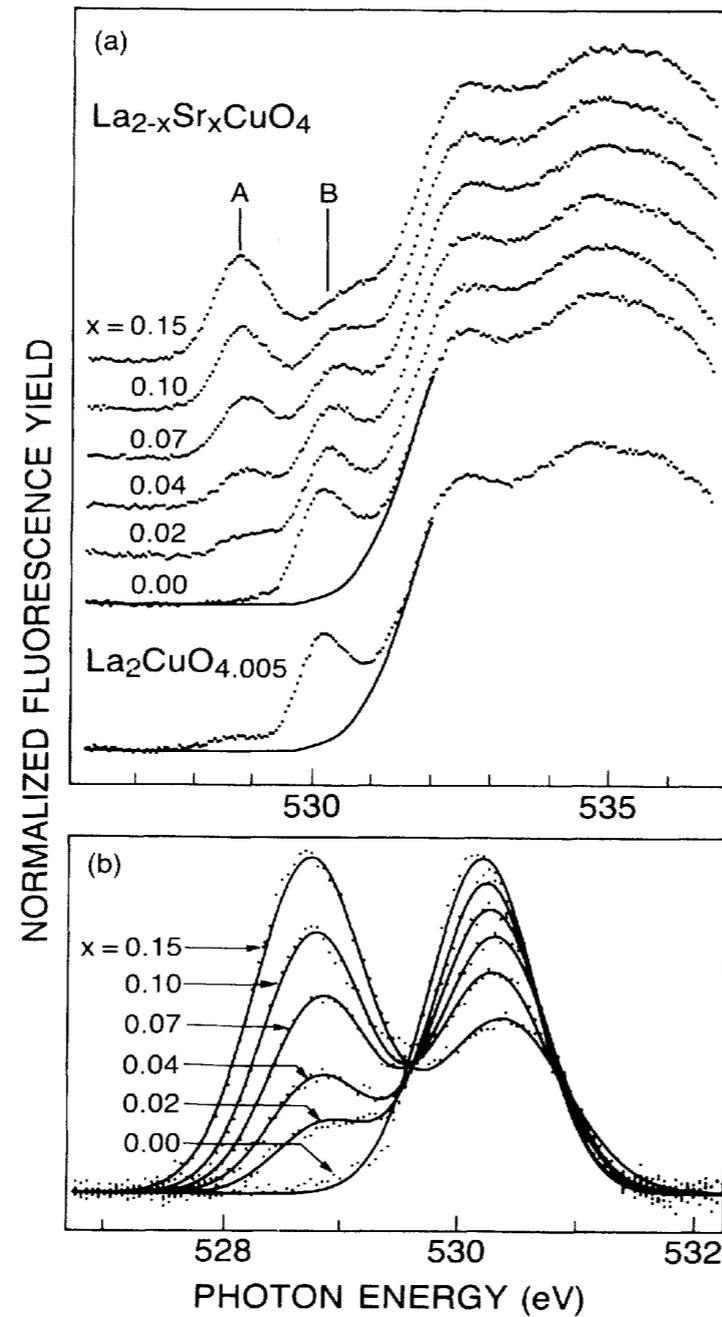
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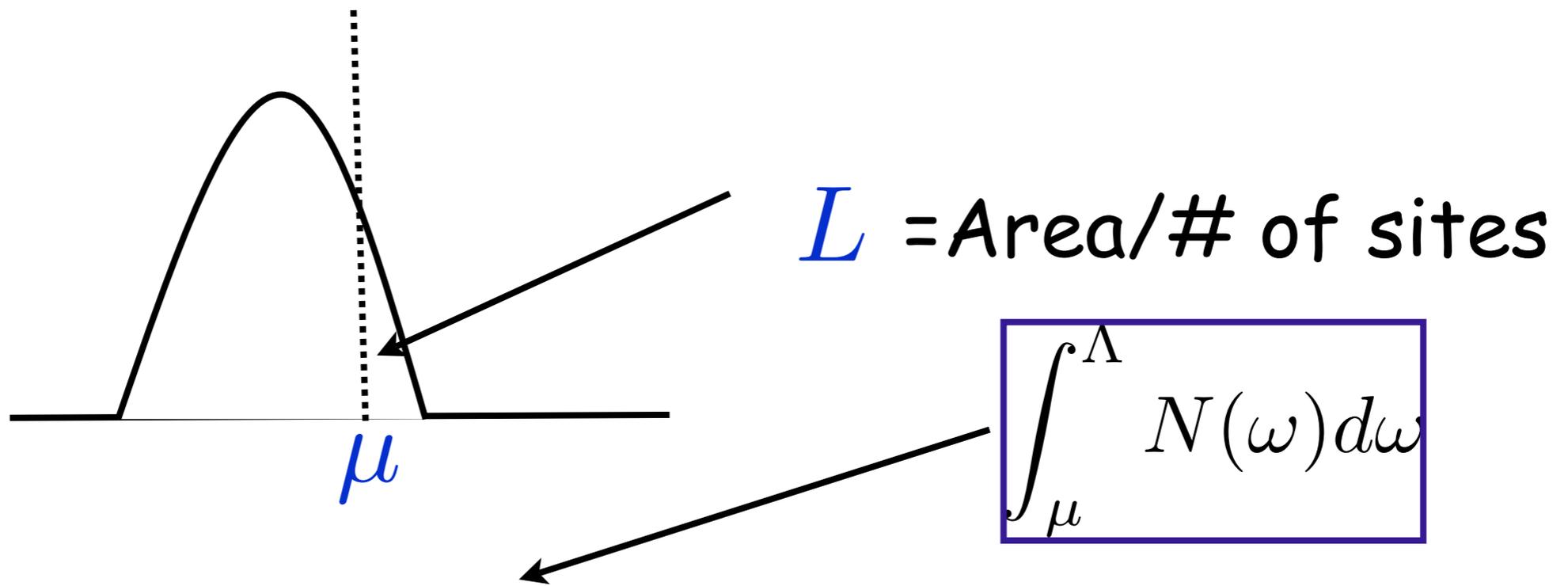
C.T. Chen,  
Batlogg,  
et al. 1990



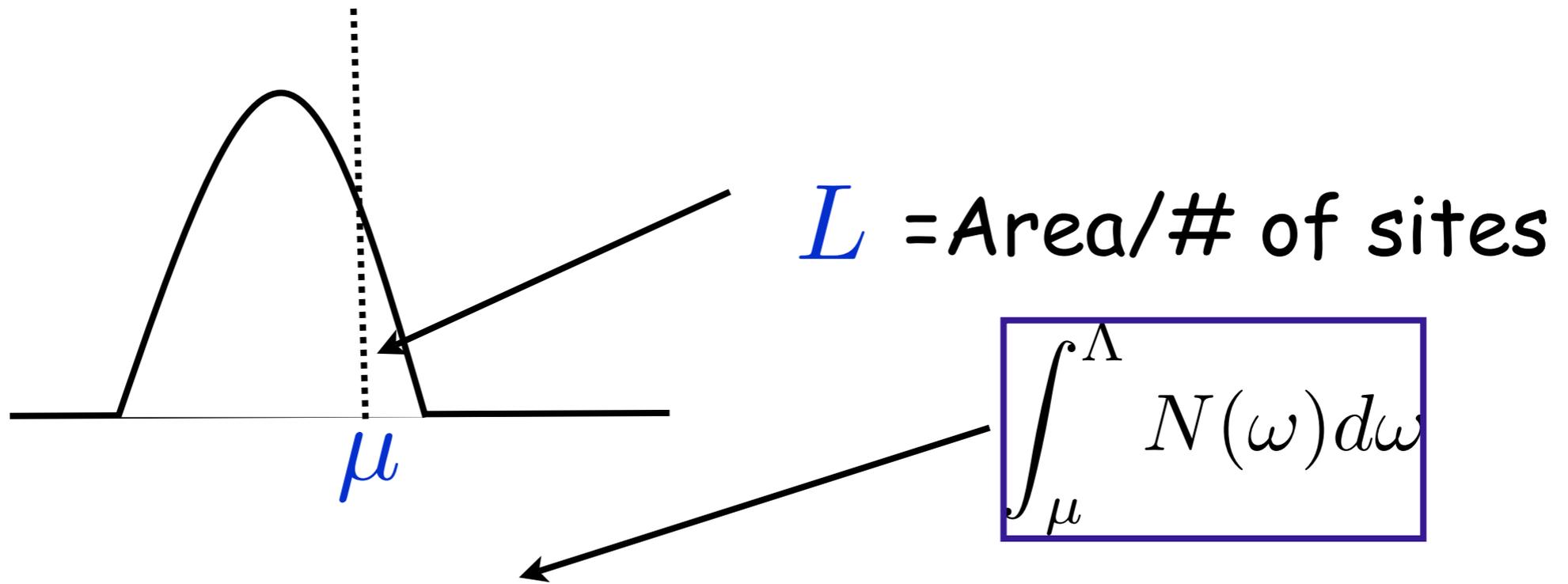
No saturation

**Is the claim of saturation correct?**

What is being measured?



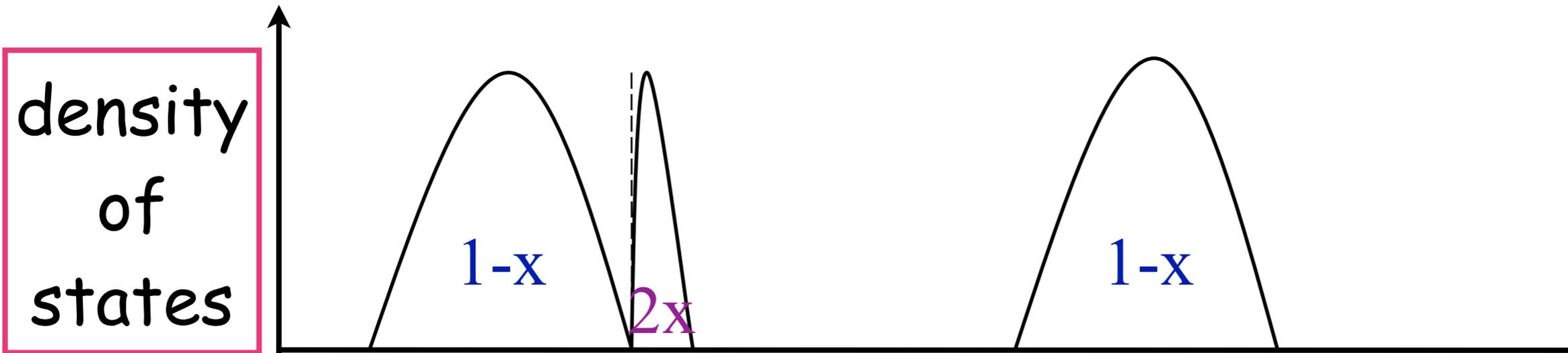
$L = \#$  of single-particle  
addition states (qp)



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In no model does  $L$  saturate!!

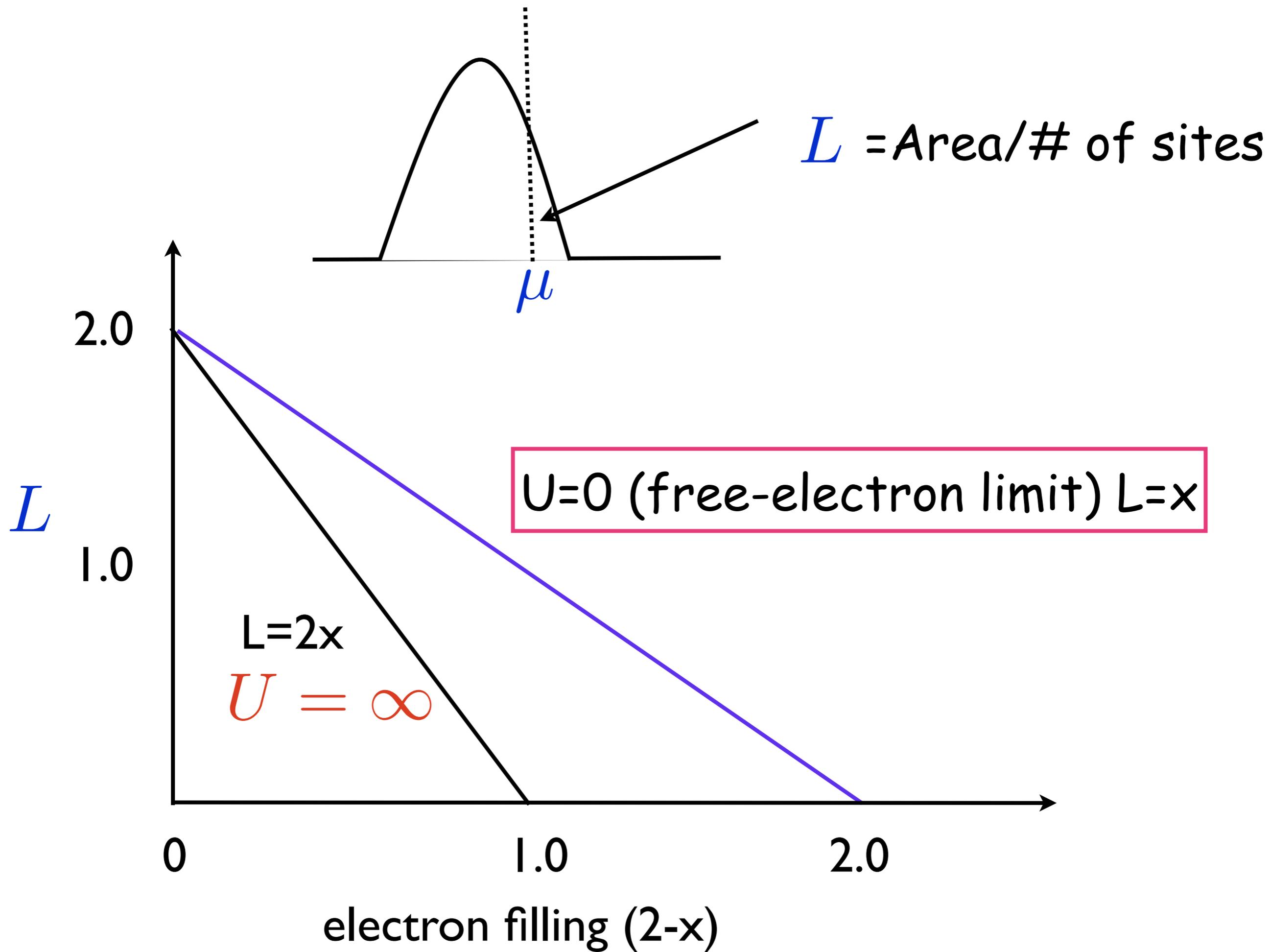
# Hubbard model atomic limit: $x$ holes

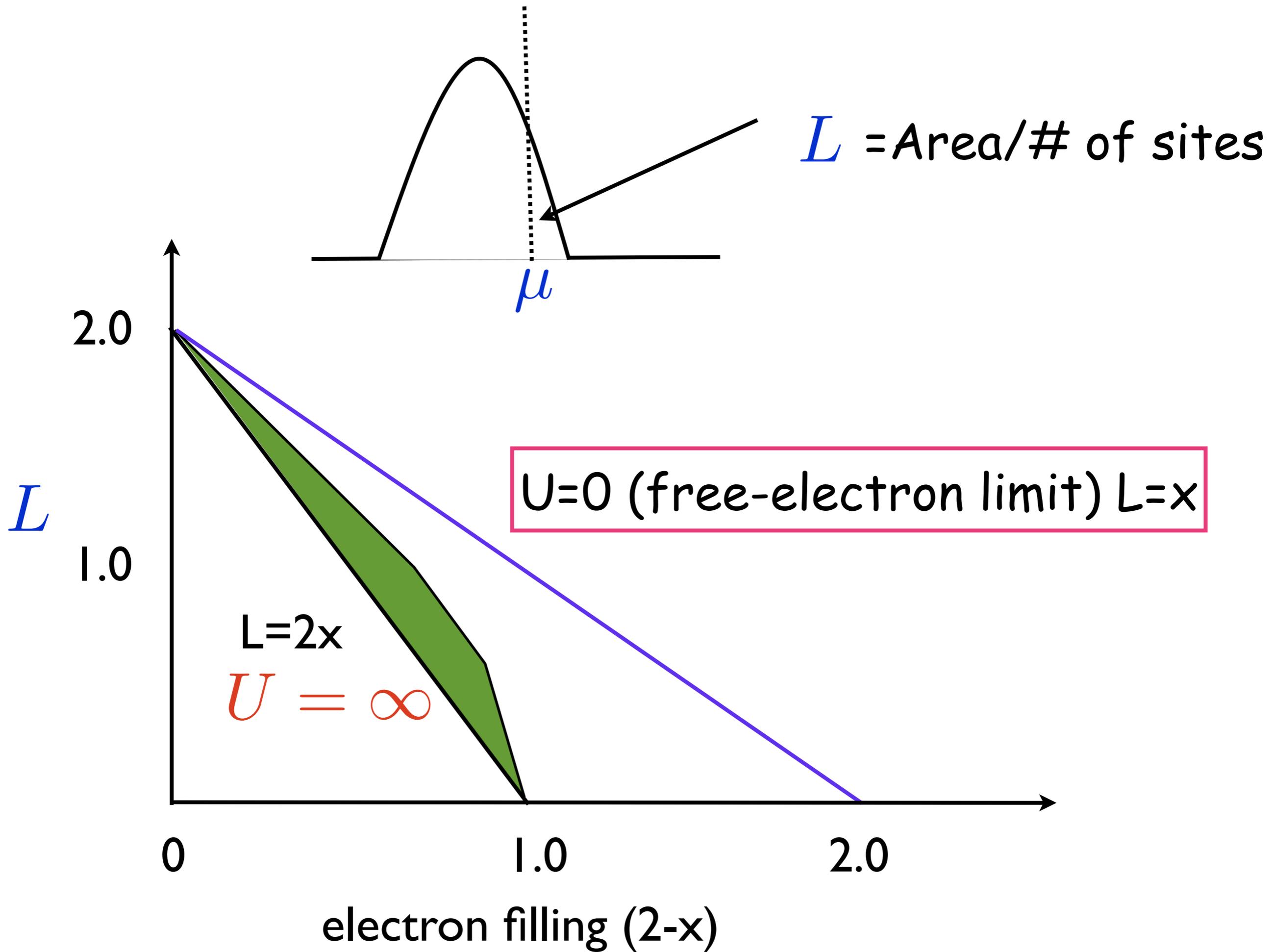


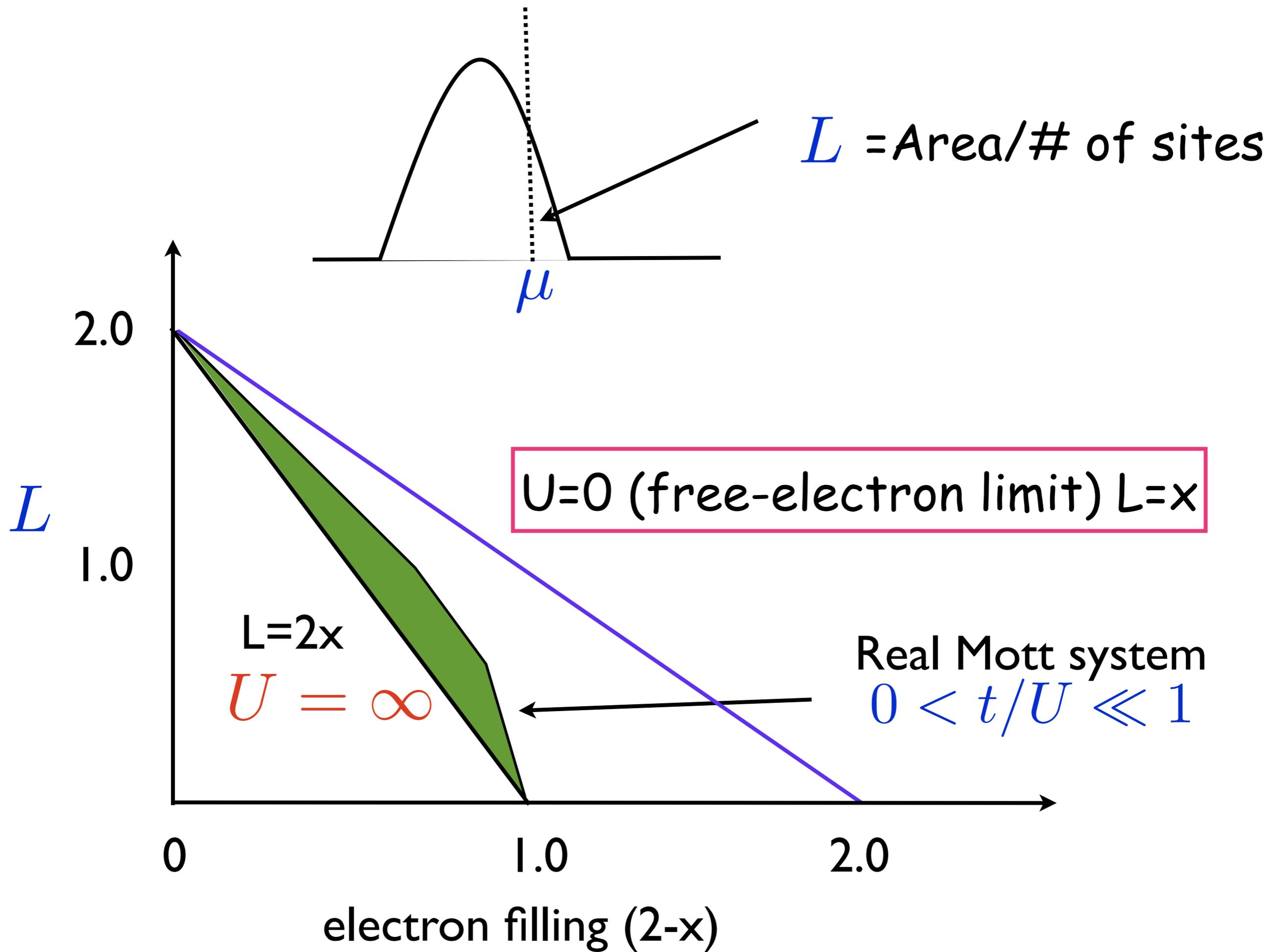
PES  $\epsilon_F$

IPES

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

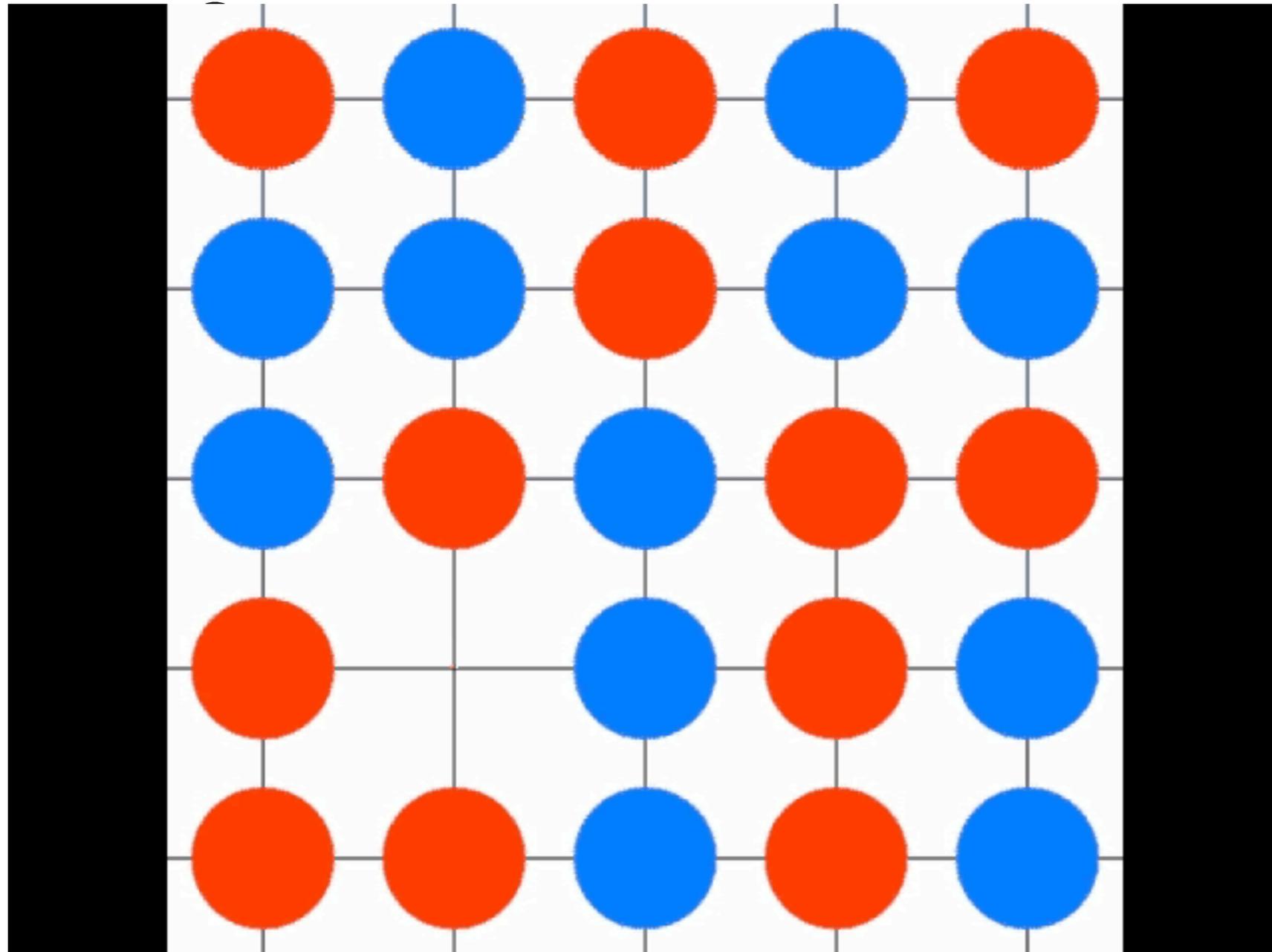






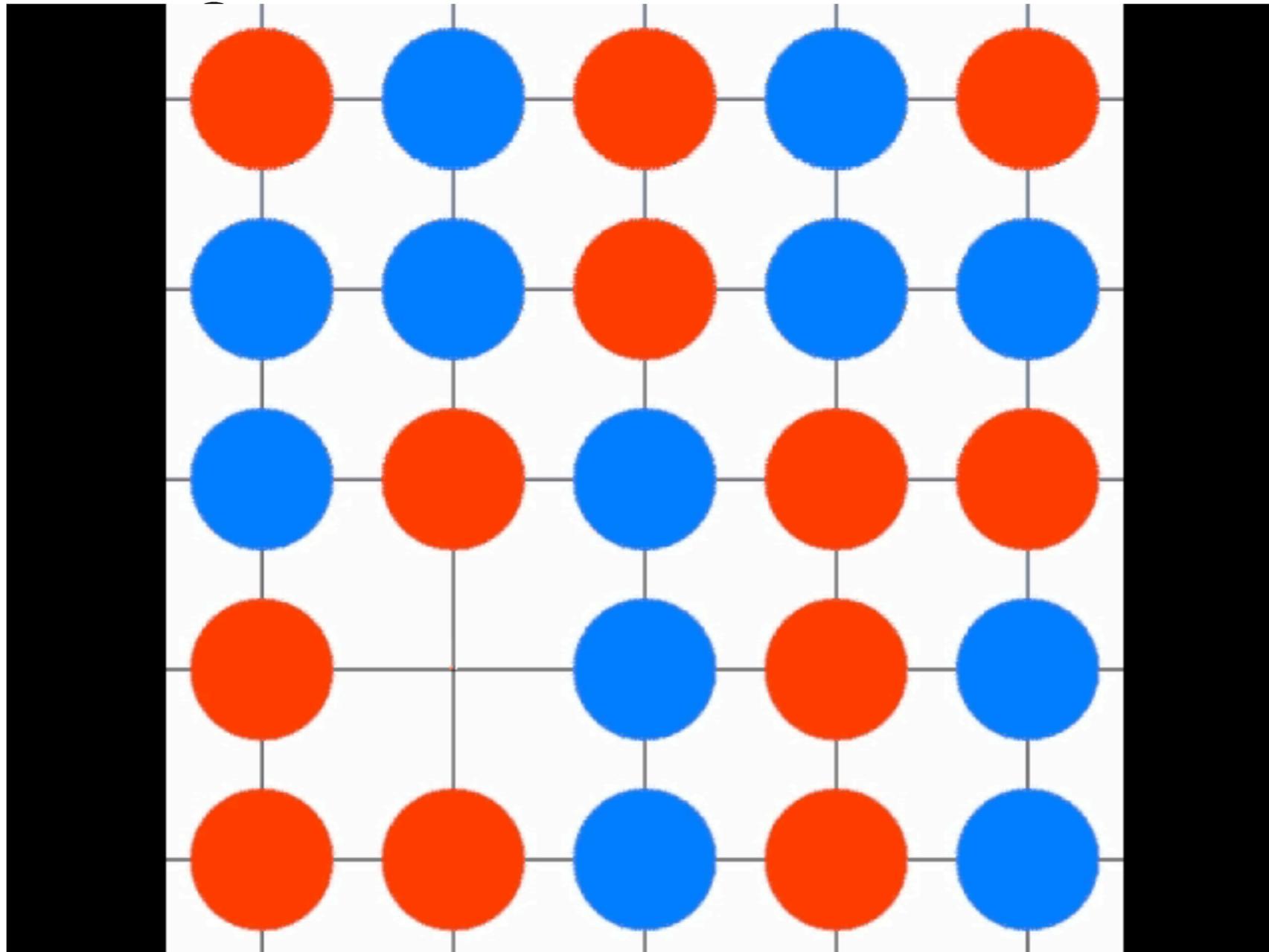
quantum Mottness:  $U$  finite

$$U \gg t$$



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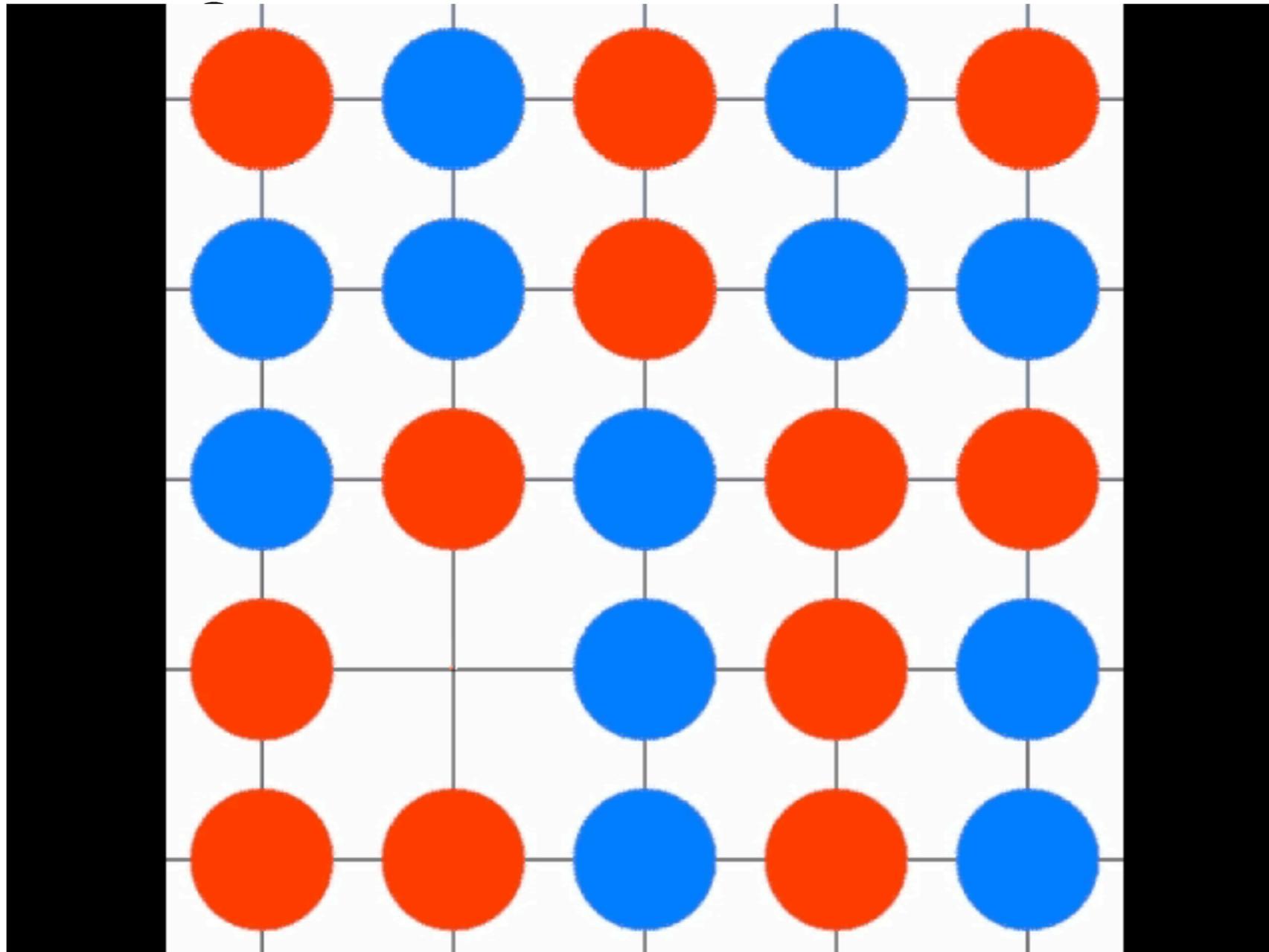
$$U \gg t$$



double occupancy in ground state!!

quantum Mottness:  $U$  finite

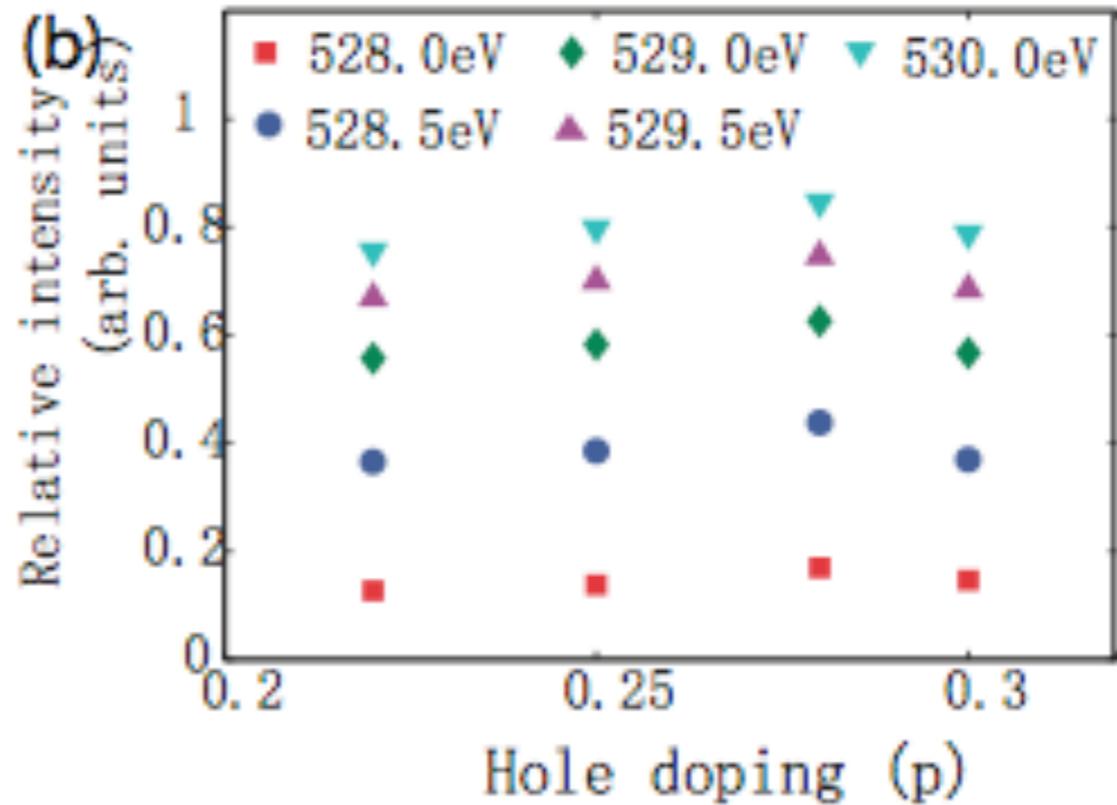
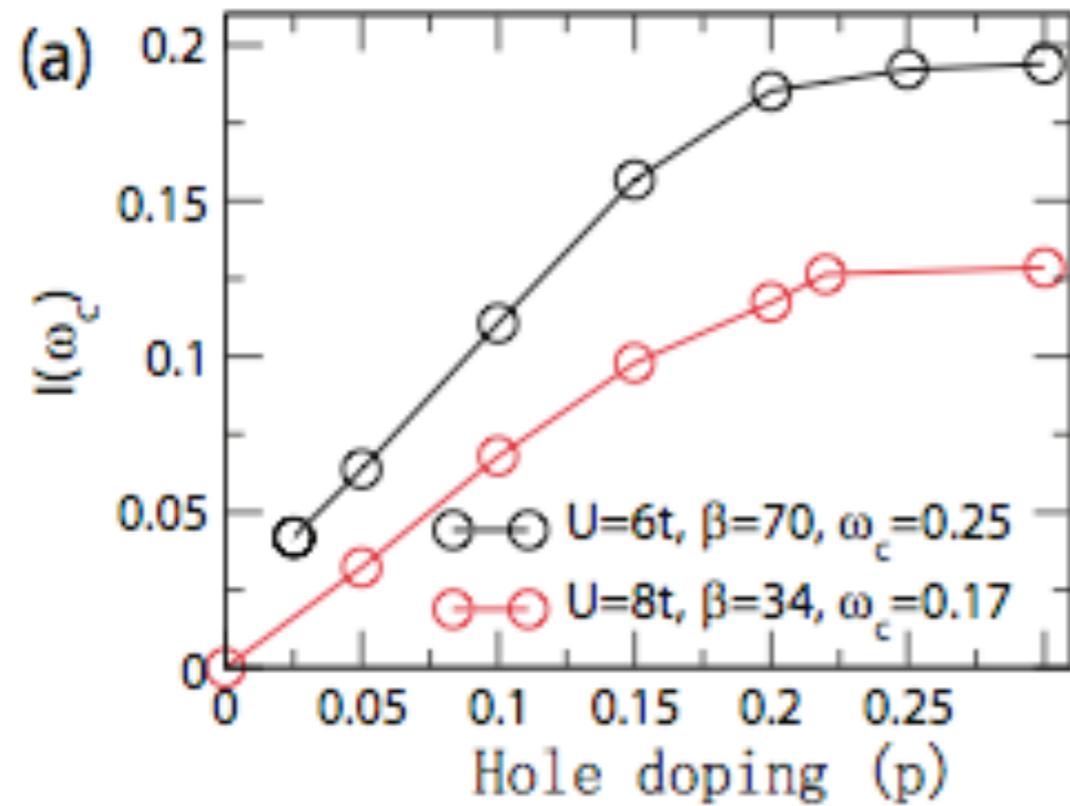
$$U \gg t$$



double occupancy in ground state!!

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

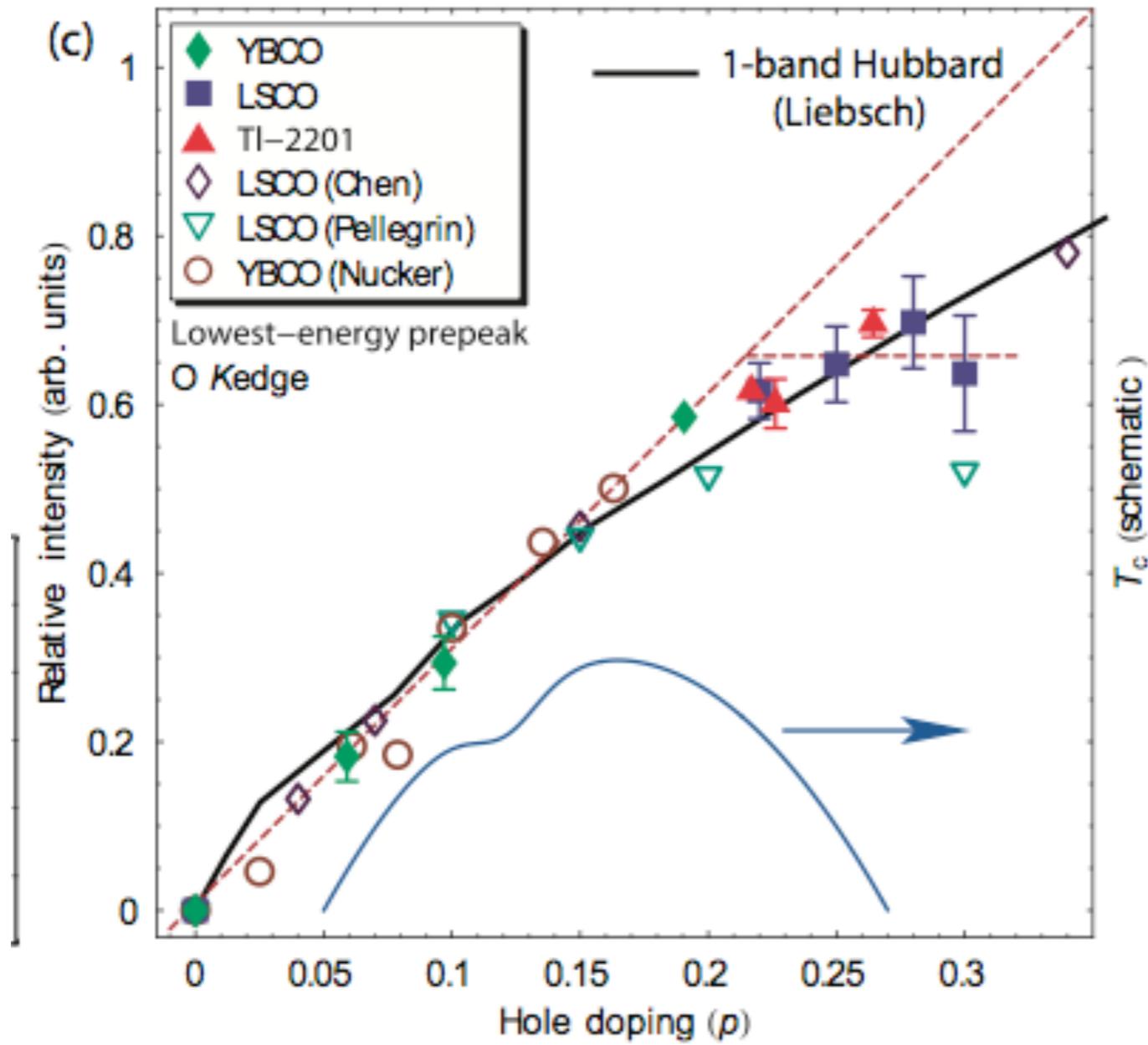
# Is this just a cut-of problem?



No

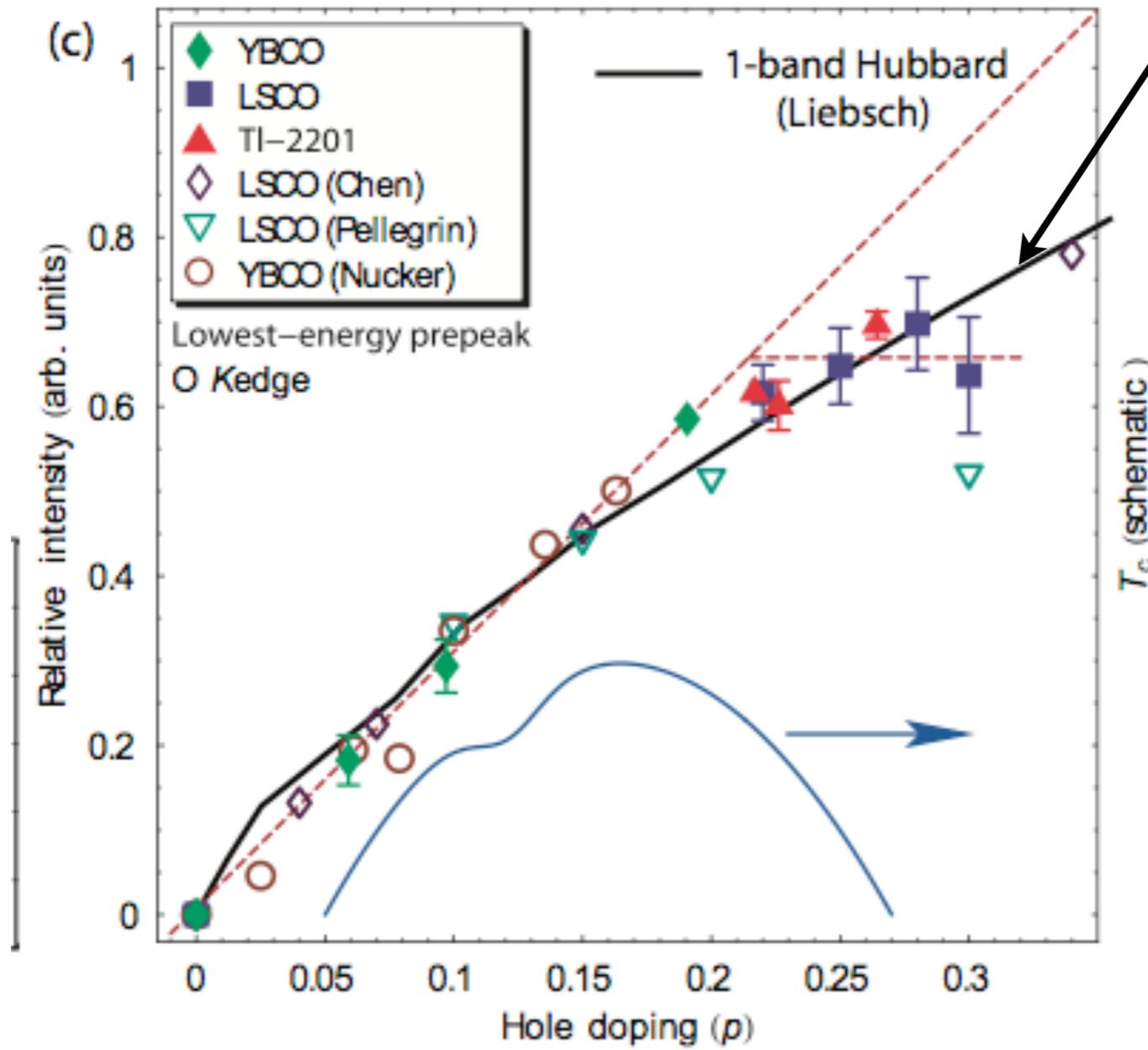
Why not compare experiments with I-band Hubbard model?

# Why not compare experiments with 1-band Hubbard model?



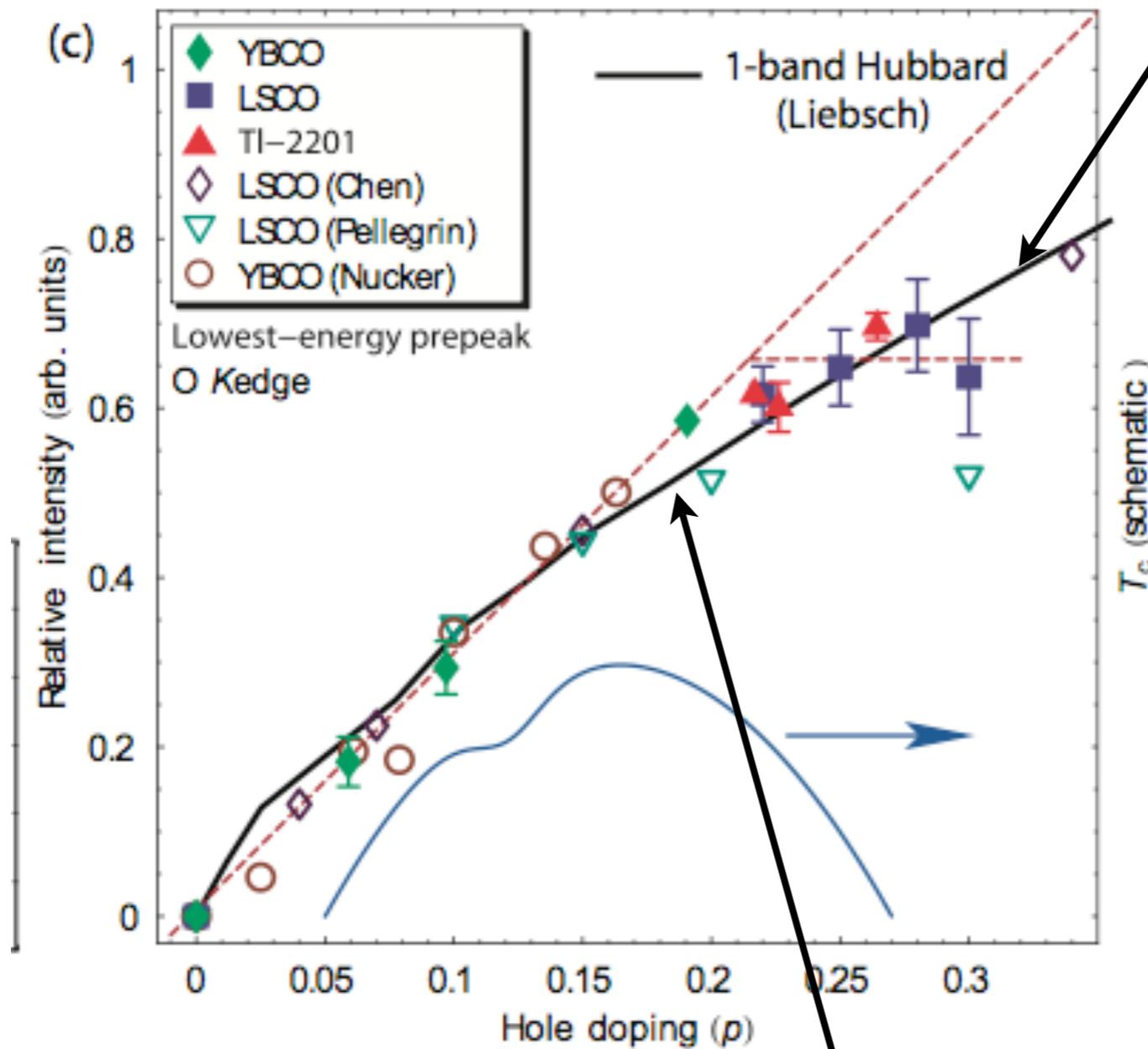
# Why not compare experiments with I-band Hubbard model?

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