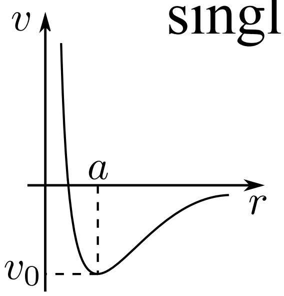
Interplay between classical localization and quantal ZPF

$\delta x \delta k \geq 1$ $\qquad \varepsilon = \frac{\hbar^2 k^2}{2m}$ $\qquad \delta k = \frac{\delta \varepsilon}{\hbar v_F}$ $\qquad (v_F/c \approx 0.27)$

$\boxed{\text{structure}}$

Independent motion of

single nucleons

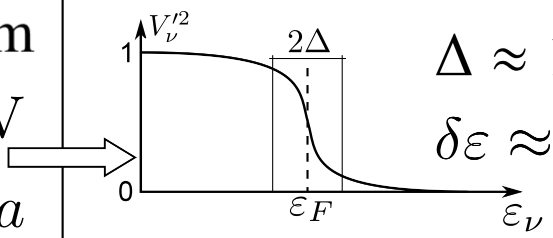


$a \approx 0.9$ fm

$v_0 = -100$ MeV

$\delta\varepsilon = |v_0|; \delta x \approx a$

pairs of nucleons



$\Delta \approx 1.5$ MeV

$\delta\varepsilon \approx 2\Delta; \delta x = \xi$

$$\xi = \frac{\hbar v_F}{2\Delta} \approx 18 \text{ fm}$$

quantality parameter

$$q = \frac{\hbar^2}{ma^2}\frac{1}{|v_0|} \approx 0.5$$

delocalization

$$q_\xi = \frac{\hbar^2}{2m\xi^2}\frac{1}{2\Delta} \approx 0.06$$

long range correlation

emergent property: generalized rigidity in

3D-space | gauge space

¿how does a short range force lead to

single-nucleon mean free paths | pairing correlations over distances

larger than nuclear dimension?

$$2R \approx 20/k_F$$

quantal

fluctuations | phase correlations

$\boxed{\text{reactions}}$

single particle transfer, e.g. *(p,d)*

the *absolute cross section* reflects the full renormalized nucleon transfer amplitude (energy, single-particle content, radial dependence of the wave function (formfactor))

Cooper pair transfer, e.g. *(p,t)*

Successive (dominant mechanism) and simultaneous transfer amplitude contributions to the *absolute cross section* carry in a equal efficient manner information concerning pair correlations