# Interplay between classical localization and quantal ZPF

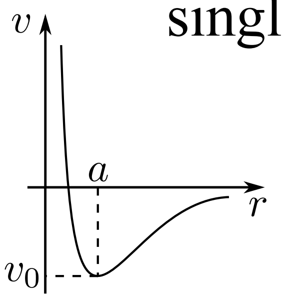
$\delta x \delta k \geq 1 \quad \varepsilon = \frac{\hbar^2 k^2}{2m} \quad \delta k = \frac{\delta \varepsilon}{\hbar v_F}$

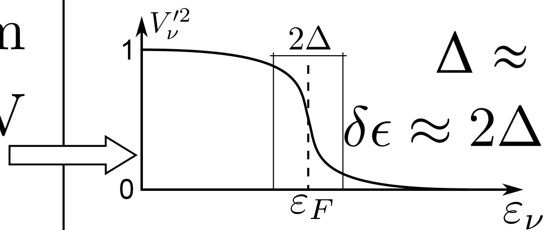
$\boxed{\text{structure}}$

$(v_F/c \approx 0.27)$

Independent motion of

| single nucleons | pairs of nucleons |
|---|---|
| $a \approx 1$ fm | $\Delta \approx 1.5$ MeV |
| $v_0 = -100$ MeV | $\delta\epsilon \approx 2\Delta; \; (\delta k)^{-1} = \xi$ |
| | $\xi = \frac{\hbar v_F}{2\Delta} \approx 18$ fm |




quantality parameter

| | |
|---|---|
| $q = \frac{\hbar^2}{ma^2}\frac{1}{\lvert v_0\rvert} \approx 0.5$ | $q_\xi = \frac{\hbar^2}{2m\xi^2}\frac{1}{2\Delta} \approx 0.02$ |
| delocalization | long range correlation |

emergent property: generalized rigidity in

| | |
|---|---|
| 3D-space | gauge space |

¿how does a short range force leads to

| | |
|---|---|
| single-nucleon mean free paths | pairing correlations over distances |

larger than nuclear dimension?

$R \approx 8/k_F$

quantal

| | |
|---|---|
| fluctuations | phase correlations |

$\boxed{\text{reactions}}$

| | |
|---|---|
| single particle transfer, e.g. *(p,d)* | Cooper pair transfer, e.g. *(p,t)* |
| the *absolute cross section* reflects the full renormalized nucleon transfer amplitude (energy, single-particle content, radial dependence of the wave function (formfactor)) | Successive (dominant mechanism) and simultaneous transfer amplitude contributions to the *absolute cross section* carry in a equal efficient manner information concerning pair correlations |