Vibrations

(ph) | (pp), (hh)

correlated excitations (E_{corr})
with transfer quantum number

$\beta = 0$ | $\beta = \pm 2$

waves on

the nuclear | the Fermi

surface

correlation length

$$\xi = \frac{\hbar v_F}{\pi |E_{corr}|}$$

typical values (finite nuclei), E_{corr}=-2.0 MeV (-0.5 MeV, ^{11}Li), $v_F/c \approx 0.27$ $(0.16,\ ^{11}\mathrm{Li})$

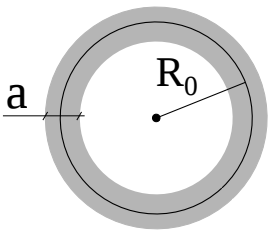
ξ = 14 fm (20 fm, ^{11}Li)

generalized quantality parameter

$$q_\xi = \frac{\hbar^2}{2m\xi^2}\frac{1}{|E_{corr}|} \approx 0.05 \quad (0.1,^{11}\,\mathrm{Li})$$

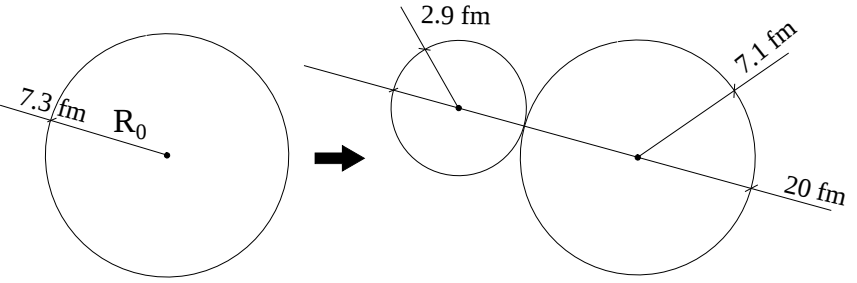
strongly correlated ($q_\xi \ll 1$), weakly "bound" ($|E_{corr}|/\epsilon_F \lesssim 0.06$)
very extended ($\xi/d \gtrsim 7$, $d = \left(\frac{4\pi R^3}{3A}\right)^{1/3}$) objects

subject to a strong external field



example

$^{223}\mathrm{Ra} \rightarrow {}^{14}\mathrm{C} + {}^{209}\mathrm{Pb}$ $(\lambda = PfT)$



$$P = \begin{cases} 10^{-76} & (\Delta = 0) \\ 10^{-10} & \Delta_{emp} \end{cases}$$

$$\langle r^2 \rangle^{1/2}_{def} = \xi = \frac{\hbar v_F}{\pi |E_{corr}|} \approx 29 \text{ fm}$$

$(E_{corr} \approx 0.6$ MeV)

$$\langle r^2 \rangle^{1/2}_{Cooper} = \xi = \frac{\hbar v_F}{\pi \Delta} \approx 21 \text{ fm}$$

$(\Delta \approx 0.8$ MeV)