

Präsenz (Formfaktor)

$$F(\vec{q}) = a \int_V f(\vec{x}) e^{\frac{-i\vec{q}\vec{x}}{\hbar}} dV, \quad k = \frac{2\pi}{\lambda}$$

$$F^*(\vec{k}) = b \int f(\vec{x}) e^{-i\vec{k}\vec{x}} dV$$

$$\begin{aligned} \int_V e^{i\vec{k}\vec{r}} &= \int_0^R \int_0^\pi \int_0^{2\pi} e^{\underbrace{-ikr \cos(\vartheta)}_{-u}} r^2 dr \underbrace{\sin(\vartheta) d\vartheta}_{du} d\varphi \\ &= 2\pi \int_{-1}^1 e^{ikru} r^2 dr du - 2\pi \int \left[\frac{1}{kr} e^{ikru} \right]_1^1 r^2 dr \\ &= -2\pi \int_0^R \frac{\sin(kr)}{kr} r^2 dr = -R \cos(kR) - \sin(kR) \end{aligned}$$

$$\begin{aligned} \int_0^R r \sin(r) &= [-r \cos(r)]_0^R + \int \cos(r) dr = [-r \cos(r)]_0^R - [\sin(r)]_0^R \\ qR = 4 &\Rightarrow R = \frac{4}{q} = \frac{4}{1.8 \text{ fm}^{-1}} = 2.2 \text{ fm} \end{aligned}$$

