# SIMPLEST MODEL → RFG (Moniz 1972)

- $\nu$ interacts only with one nucleon in the FREE Fermi sea
- scattered nucleon lies outside Fermi sphere PAULI BLOCKING ↓ "FSI"

Using

$$J^\mu = \sum_{\substack{p\,s \\ p's'}} J^\mu_{sN}\; a^+_{p's'}\, a_{ps}\; \theta(p_F - p)\,\theta(p' - p_F)$$

$$J^\mu_{sN} = \sqrt{\frac{m_N}{V E_p}}\sqrt{\frac{m_N}{V E_{p'}}}\;\bar{u}(p's')\,\Gamma^\mu\,u(ps)$$

one gets

$$W^{\mu\nu} = \frac{V}{(2\pi)^3}\int d^3p\,(2\pi)^3\,\delta(E_p + \omega - E_N)\,\delta^{(3)}(\vec{p}+\vec{q}-\vec{p}_N)\,\frac{m_N^2}{E_p E_N}\,2\,w^{\mu\nu}_{sN}$$

$$\times\,\theta(p_F - p)\,\theta(p_N - p_F)$$

may add "shift" $\omega' = \omega - \omega_{sh}$

$$= \frac{3\mathcal{N}\rho\, m_N^2}{4\pi p_F^3}\int \frac{d^3p}{E_p E_N}\,(2\pi)^3\,\delta(E_p + \omega - E_N)\,\delta^{(3)}(\vec{p}+\vec{q}-\vec{p}_N)$$

$$\theta(p_F - p)\,\theta(p_N - p_F)\,w^{\mu\nu}_{sN}$$

having used $\rho = \frac{A}{V} = \frac{2k_F^3}{3\pi^2}$ with $\mathcal{N} = N = Z = A/2$

$$w^{\mu\nu}_{\substack{\text{single} \\ \text{nucleon}}} = \frac{1}{2}\sum_{ss'}\left[\bar{u}(p_N s')\,\Gamma^\mu\,u(ps)\right]^*\left[\bar{u}(p_N s')\,\Gamma^\nu\,u(ps)\right]$$