starting from $\mathcal{H}_I = \frac{G}{\sqrt{2}}\, j_\mu(x)\, J^\mu(x)$ low Q^2

with $G = \begin{cases} G_F & \text{NC} \\ G_F |V_{ud}| & \text{CC} \end{cases}$

$$j_\mu(x) = \frac{1}{\sqrt{2E_\nu}} \frac{1}{\sqrt{2E'_\nu}}\, \bar{u}(k')\gamma_\mu(1 \mp \gamma_5)u(k)\, e^{-i(k-k')\cdot x}$$

(j_μ; no Coulomb distortion; $m' = 0$)

J^μ nuclear current

$$S_{fi} = \frac{G}{\sqrt{2}} (2\pi)\delta(E_I - E_F)\, j_\mu \langle N, A-1 | J^\mu(q) | A \rangle$$

$$d\sigma = \frac{G^2}{2} \frac{(2\pi)}{EE'} [\eta_{\mu\nu}] \Big[V^3 \sum \delta(E_I - E_F)$$

$$* \langle N, A-1 | J^\mu(q) | A \rangle^* \langle N, A-1 | J^\nu(q) | A \rangle \Big] \frac{d^3k'}{(2\pi)^3} \frac{d^3p_N}{(2\pi)^3}$$

LEPTONIC TENSOR

$$\eta_{\mu\nu} = \frac{1}{8} \mathrm{Tr}\left[(\not{k} + m)\gamma_\mu(1 \mp \gamma_5)(\not{k}' + m')\gamma_\nu(1 \mp \gamma_5) \right]$$

$$= k_\mu k'_\nu - g_{\mu\nu} k\cdot k' + k'_\mu k_\nu \pm i\, \epsilon_{\mu\nu\alpha\beta} k^\alpha k'^\beta$$

$+ \rightarrow \nu$

$- \rightarrow \bar{\nu}$

["] = HADRONIC TENSOR containing all nuclear physics