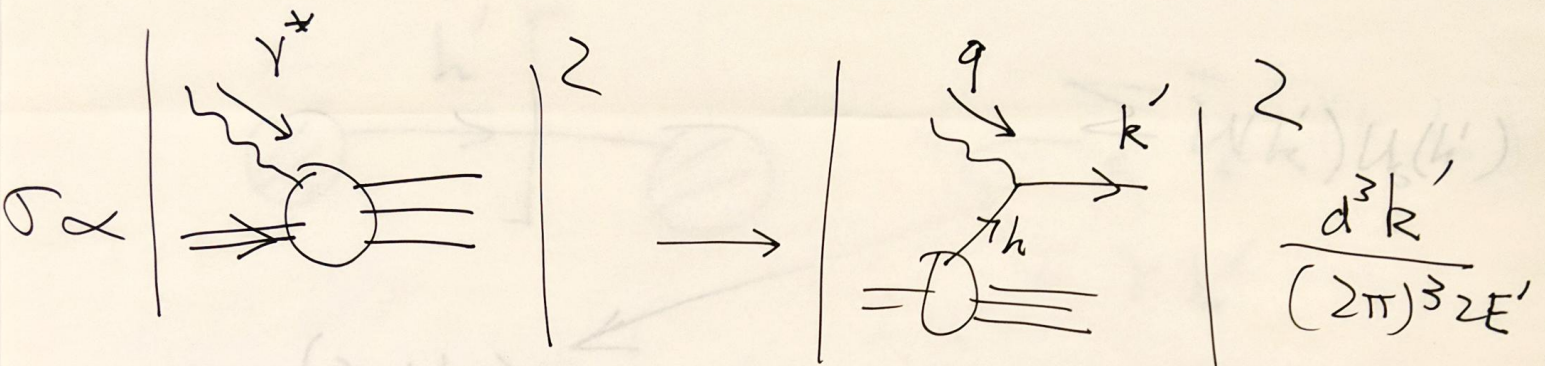


HUGS 2021



$$\frac{d^3 k'}{(2\pi)^3 2E'}$$

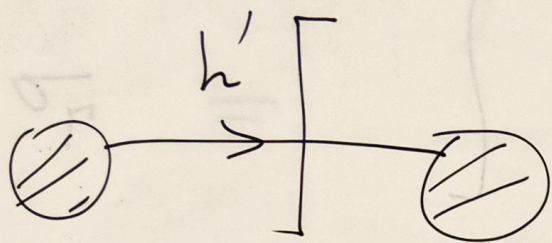
$$\frac{d^4 k'}{(2\pi)^4} 2\pi \delta_+(k'^2)$$

$$(2\pi)^4 \delta^4(q+h-k')$$

$$\sum_s \bar{u}(h') u_s(k') (2\pi)$$

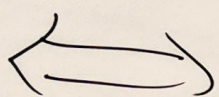
$$\frac{q \cdot h'}{k'^2 \pm i\epsilon}$$

$$\frac{1}{q \cdot h'} (\pi \delta(k'^2))$$

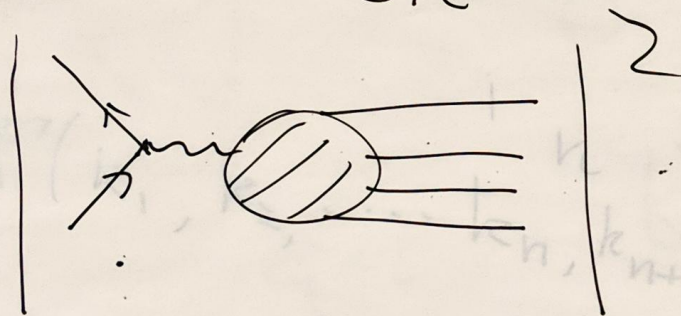


$$\sum_s \bar{u}_s(k') u_s(k') = \gamma \cdot k'$$

$$(\gamma \cdot k') \frac{1}{2\pi \delta((k')^2)}$$

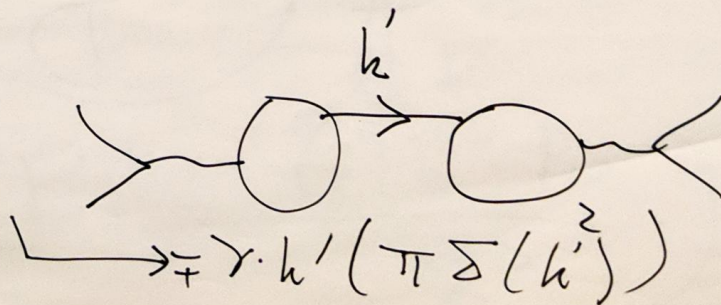


$$\frac{\gamma \cdot k'}{k'^2 \pm i\epsilon}$$



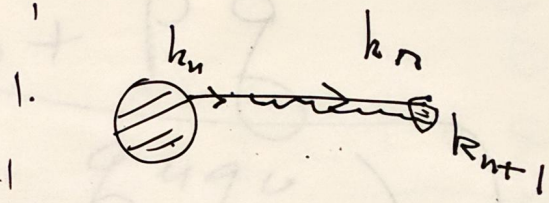
$$= 2 \cdot \text{Im} \left[\text{Diagram} \right]$$

$$\frac{\gamma \cdot k'}{k'^2 \pm i\epsilon}$$



$$\rightarrow \gamma \cdot k' (\pi \delta(k'^2))$$

$$g_{\Gamma} = \int d\Omega_2 \left(\frac{d\sigma}{d\Omega_2} \right) \Gamma(k_1, k_2) + \int d\Omega_3 \left(\frac{d\sigma}{d\Omega_3} \right) \Gamma(k_1, k_2, k_3)$$



$$\Gamma(k_1, k_2, \dots, k_n, k_{n+1}, \dots, (1-\lambda)k_n) = \Gamma(k_1, k_2, \dots, k_n) \quad \lambda \rightarrow 1$$

$$\tilde{p}^{\mu} = \frac{g^{\mu\nu} p_{\nu}}{g^{\alpha\beta} p_{\alpha} p_{\beta}}$$

$W^{\mu\nu}$ (P. 9)

$$g^{\mu\nu}, \quad p^\mu p^\nu, \quad g^\mu g^\nu$$

$$\tilde{g}^{\mu\nu} \equiv \left(\begin{array}{c|c} g_{\mu\nu} & g^\mu g^\nu \\ \hline p^\mu g^\nu + p^\nu g^\mu & g^2 \end{array} \right)$$

$$\tilde{g}_{\mu\nu} \cdot g^\mu = 0$$

$$\tilde{p}^\mu = \left(\begin{array}{c|c} \tilde{g}^{\mu\nu} & g^\nu \\ \hline p^\mu & g^2 \end{array} \right)$$

$$\tilde{g}_{\mu\nu}$$

$$\tilde{p}_\mu \tilde{p}_\nu$$

$$\left(g_{\mu\nu} - \frac{g_\mu g_\nu}{g^2} \right)$$

$$\left(p_\mu - \frac{p_\nu g^\nu}{g} \right)$$

$$\times \left(p_\nu - \frac{p_\mu g^\mu}{g^2} \right)$$

$$\tilde{g}_{\mu\nu} \cdot \delta_\nu = 0$$

$$\delta_{\mu\nu} \epsilon^{\mu\nu\alpha\beta} g_\alpha \left[\begin{matrix} \rho_\beta \\ \sigma_\beta \end{matrix} \right]$$