2023 - IC Física de Partículas

Distribuições Partônicas

Parametrizações

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Universidade do Estado de Santa Catarina

UDESC
UNIVERSIDADE
DO ESTADO DE
SANTA CATARINA

Seções

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Introdução
O Modelo Padrão

Introdução

O Modelo Padrão para a Física de Partículas

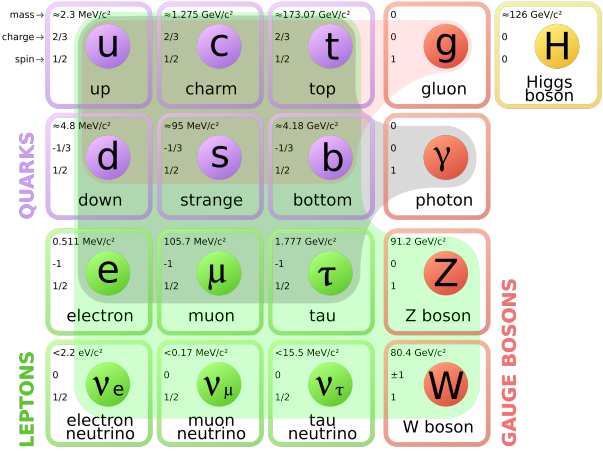

Figura 1: Fonte: (WORKMAN et al., 2022)

DIS

Deep Inelastic Scattering

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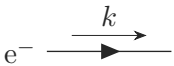
A Estrutura dos Hádrons

Deep Inelastic Scattering



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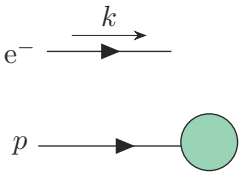

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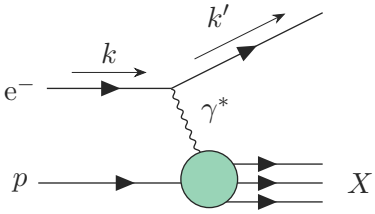

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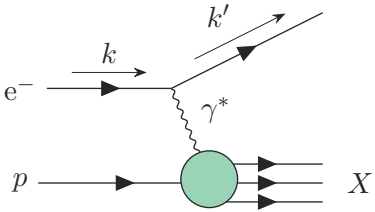
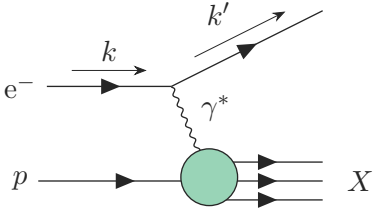


$$\left.\frac{d\sigma}{d\Omega dE'}\right|_{ep\to eX} = \left(\frac{\alpha^2}{4E^2\sin^4\theta/2}\right)\frac{1}{4EE'}L^{\mu\nu}_{(L)}W^{(H)}_{\mu\nu}$$

A Estrutura dos Hádrons

Deep Inelastic Scattering



$$\left.\frac{d\sigma}{d\Omega dE'}\right|_{ep\to eX} = \left(\frac{4\alpha^4 E'^2}{q^4}\right)\left[2\sin^2\frac{\theta}{2}W_1(\nu,Q^2) + \right.$$
$$\left. + \cos^2\frac{\theta}{2}W_2(\nu,Q^2)\right]$$

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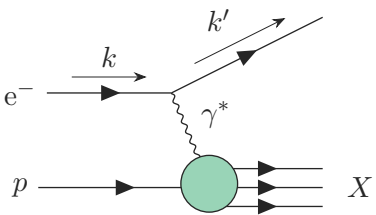
Deep Inelastic Scattering



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$$\left. + \cos^2\frac{\theta}{2}W_2(\nu,Q^2)\right]$$

$$\left.\begin{aligned} s &\equiv (p+k)^2 = E_{cm}^2, \\ t &\equiv (k-k') = -Q^2, \\ u &\equiv (k-p_x)^2 \end{aligned}\right\}$$

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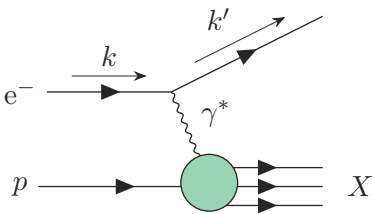

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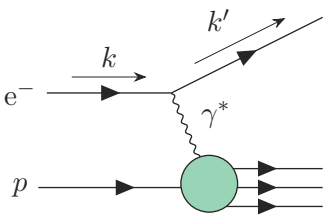
A Estrutura dos Hádrons

Deep Inelastic Scattering



$$\left.\begin{aligned} s &\equiv (p+k)^2 = E_{cm}^2, \\ t &\equiv (k-k') = -Q^2, \\ u &\equiv (k-p_x)^2 \end{aligned}\right\} \qquad s+t+u = M^2 + W^2$$

$$\frac{d\sigma}{d\Omega dE'} = \frac{1}{s+u}\left(\frac{4\pi\alpha^2}{s^2t^2}\right) \times$$
$$\times \Big[-(s+u)tMW_1(\nu,Q^2) +$$
$$-us\nu W_2(\nu,Q^2)\Big]$$

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Stanford Linear Accelerator - SLAC (1960)

$$\lim_{Q^2,\nu\to\infty} MW_1(\nu, Q^2) \approx F_1(x)$$
$$\lim_{Q^2,\nu\to\infty} \nu MW_2(\nu, Q^2) \approx F_2(x)$$

Stanford Linear Accelerator - SLAC (1960)

$$\lim_{Q^2,\nu\to\infty} MW_1(\nu, Q^2) \approx F_1(x)$$

$$\lim_{Q^2,\nu\to\infty} \nu MW_2(\nu, Q^2) \approx F_2(x) \implies x \equiv \frac{Q^2}{2M\nu}$$

Stanford Linear Accelerator - SLAC (1960)

$$\lim_{Q^2,\nu\to\infty} MW_1(\nu, Q^2) \approx F_1(x)$$

$$\lim_{Q^2,\nu\to\infty} \nu MW_2(\nu, Q^2) \approx F_2(x) \implies x \equiv \frac{Q^2}{2M\nu}$$

$$\sigma_L^{\gamma^* p} = \frac{4\pi^2\alpha}{Q^2}\left[F_2(x, Q^2) - 2xF_1(x, Q^2)\right]$$

$$\sigma_T^{\gamma^* p} = \frac{4\pi^2\alpha}{Q^2}\left[2xF_1(x, Q^2)\right]$$

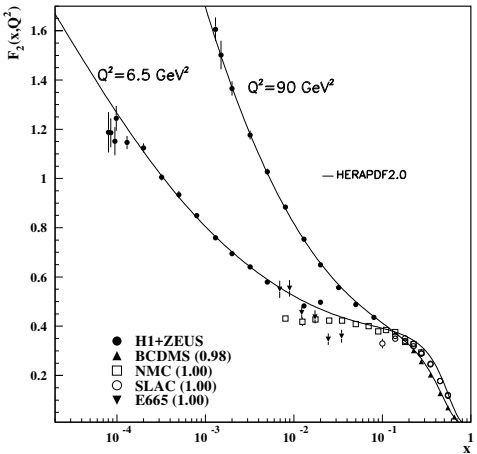
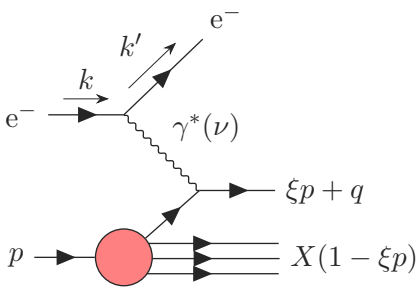


Figura 2: Fonte: (WORKMAN et al., 2022)

A Estrutura dos Hádrons

DIS no Modelo de Partons

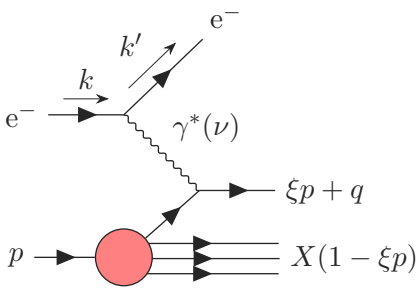


Função Densidade Partônica (PDF):

$$\sum_q \xi_q p = p$$

A Estrutura dos Hádrons

DIS no Modelo de Partons



Função Densidade Partônica (PDF):

$$\sum_q \xi_q p = p$$

$$m_q^2 = (\xi p + q)^2 = 0$$

A Estrutura dos Hádrons

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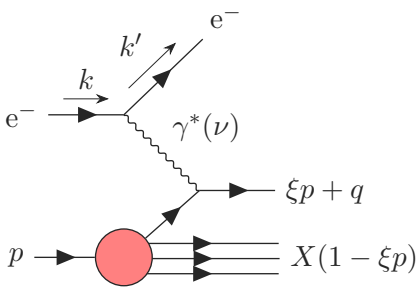

Função Densidade Partônica (PDF):

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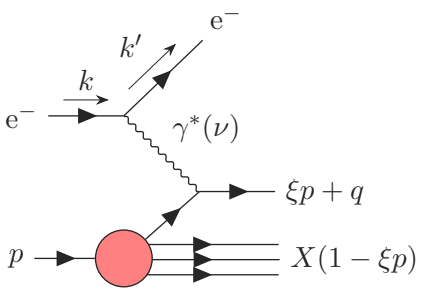

Função Densidade Partônica (PDF):

$$\sum_q \xi_q p = p$$

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$$\sigma^{\gamma^* p} = \sum_q \int_0^1 d\xi f_q(\xi) \hat{\sigma}_{L,T}^{\gamma^* p}$$

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A Estrutura dos Hádrons

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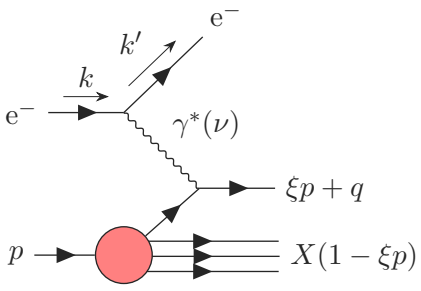

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$$\sigma_L^{\gamma^* p}(x, Q^2) = 0$$

$$\sigma_T^{\gamma^* p}(x, Q^2) = \frac{4\pi^2\alpha}{Q^2} 2xF_1(x, Q^2)$$

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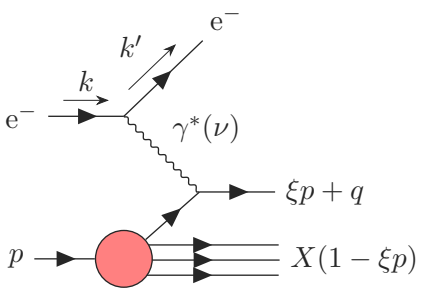

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$$m_q^2 = (\xi p + q)^2 = 0 \implies \boxed{\xi = x}$$

$$\sigma_L^{\gamma^* p}(x, Q^2) = 0 \implies$$

$$F_2(x, Q^2) = 2xF_1(x, Q^2)$$

$$\sigma_T^{\gamma^* p}(x, Q^2) = \frac{4\pi^2\alpha}{Q^2} 2xF_1(x, Q^2)$$

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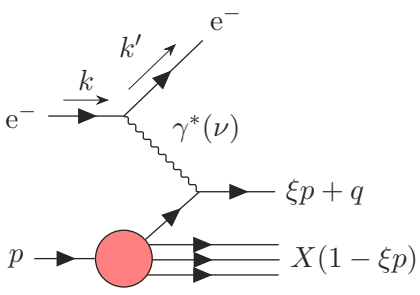

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$$m_q^2 = (\xi p + q)^2 = 0 \implies \boxed{\xi = x}$$

$$\sigma^{\gamma^* p} = \frac{4\pi^2\alpha}{Q^2} \sum_q \int_0^1 d\xi f_q(\xi) e_q^2 \delta\left(1 - \frac{x}{\xi}\right)$$

$$\sigma^{\gamma^* p} = \frac{4\pi^2\alpha}{Q^2} \sum_q e_q^2 x f_q(x)$$

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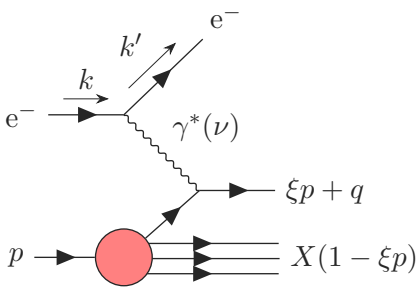

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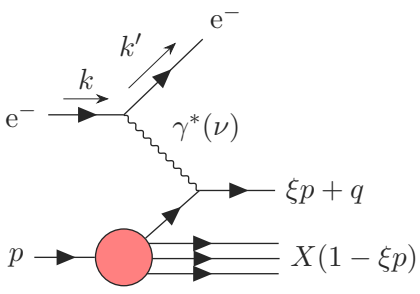

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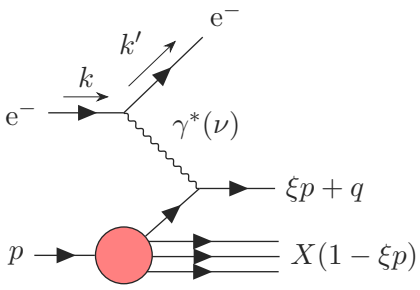

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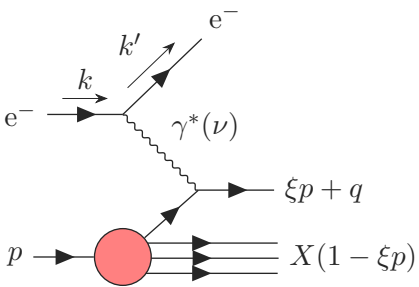

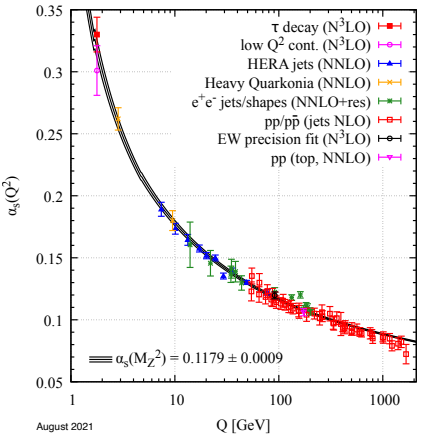

Figura 2: Fonte: (WORKMAN et al., 2022)

Referencias

WORKMAN, R. L. et al. Review of particle physics. **PTEP**, v. 2022, p. 083C01, 2022.

Contato:
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