MAXIMIZATION OF THE WEIZSACKER-WILLIAMS EQUATION IN ANNIHILATION ELECTRO-POSITRON, AND PROBABILITY OF CREATION OF HEAVY QUARKS

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1.- Introduction

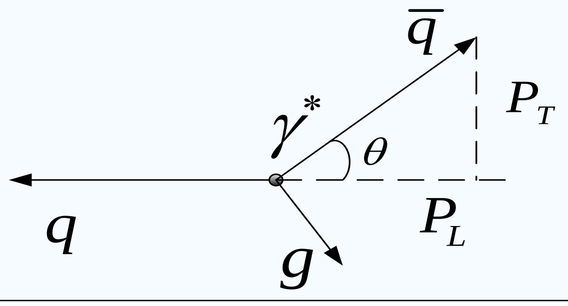
High-resolution photons can also be prepared by collision of high-energy electrons and positrons. The exceptional power of this experimental technique illustrated by the gallery of collision diagrams can be used to study QED quantum electrodynamics, weak interactions, quarks and gluons and also to study or search for heavy quarks and leptons. On the other hand, e + e$^-$ annihilation is a "clean" process in the sense that the leptons appear in the initial state.

3.- Methodology

Although the similarities between annihilation and electro-production are becoming more and more evident but we must not forget one important difference.

The events $e^- e^+ \rightarrow q\,\bar{q}\,g$ have three fragmented jets in the final state. The additional jet is a gluon. For large values of the annihilation energy Q; such that, $\alpha_s(Q^2) \approx 0.1 - 0.2$ it is expected that the three-jet event will represent approximately 10% of the final states.

We will introduce the kinematic variables to describe this phenomenon (Tres-jet). The moment vectors of; which are produced by a virtual photon at rest; are shown in Fig.



2.- objective

- Determine the effective section density function for the creation of heavy quarks with the given conditions.

- Plot the cross section of heavy quark creation with respect to the energy level.

4.- Results

Logarithmic Model for Cross Section of $e^- e^+ \rightarrow q\bar{q}g$

$$\frac{1}{\sigma}\cdot\frac{d\sigma}{dx_T^2} = \frac{4\alpha_s}{3\pi}\cdot\frac{1}{x_T^2}\left(1.4 + \ln\left(\frac{1}{x_T^2}\right)\right).$$

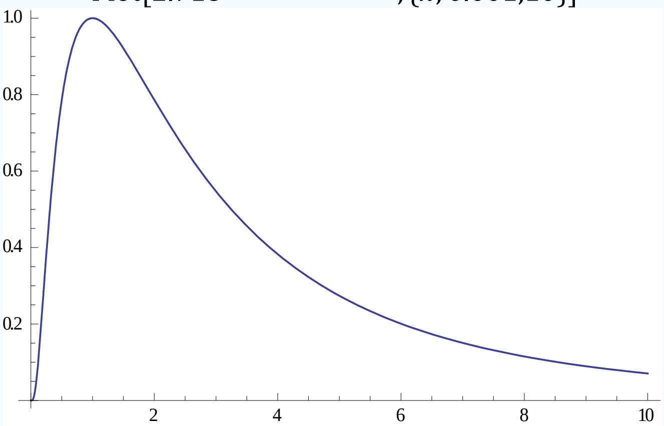
$$\sigma(x_T{}^2) = c_1 2.718^{-0.5\left[\ln^2\left(\frac{1}{x_T{}^2}\right)\right]}$$

Where:

σ : effective collision cross section
X_T : observable collision parameter
C_1 : constant for the first correction

Computational model when C = 1:

$\text{Plot}[2.718^{-0.5*\text{Ln}[\frac{1}{x}]*\text{Ln}[\frac{1}{x}]}, \{x, 0.001, 10\}]$



5. Conclusions

- It is shown that for high energies in the order of teras, the probability of production of heavy quarks increases.
- The energies that were worked were with: Q = 12GeV; 27GeV <Q <32GeV and 35GeV <Q <37GeV, by which it allows the production of heavy quarks in the electron positron **annihilation.**

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Referencias
[1] Francis Halzen and Alan D. Martin. “Quarks and Leptons: An Introductory Course in Modern Particle Physics”. (John Wiley & Sons, Inc. New York. 1984), pp. 47-67.
[2] B. R. Martin and G. Shaw: “Particle Physics”. (Third Edition. John Wiley & Sons. 2008), pp. 120-187.
[3] Chris Quigg. “Gauge Theories of the Strong, Weak, And Electromagnetic Interactions”. (Westview Press. 1997), pp. 34-89.