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A Novel Feature of Valence Quark Distributions in Hadrons[1]
MISAK SARGSIAN, CHRISTOPHER LEON, FRANK VERA, Florida International University — We report an observation of a strong correlation between the height of the maximum of valence quark structure function, xq(x), and its Bjorken-x position as a function Q^2. The observed correlation is used to derive a new model independent relation which connects the partial derivative of the valence parton distribution functions (PDFs) in x to the QCD evolution equation through the x-derivative of the logarithm of the correlation function. The numerical analysis of this relation using empirical PDFs results in a constant factor for the Q^2- range covering four-orders of magnitude. The obtained constant factor allows us to express the "height- position" correlation function in a simple exponential form which is valid for the all Q^2 range of valence PDFs being considered. A similar relation is observed also for pions, indicating that the obtained relation may be universal. The observed "height - position" correlation is used to prove the "mean field theorem" according to which no fixed number constituent exchanges can be responsible for the valence quark distributions that produce a peak in the xq(x) distribution, thereby in the hadron structure function, $F_2(x)$.

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