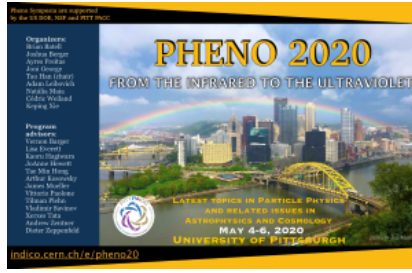Contribution ID: **968**   Type: **Parallel Talk**

The Electroweak PDFs (I): the general considerations

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The collinear factorization of the photon parton distribution function (PDF), such as the Weizsaicker-Williams approximation, i.e., "equivalent photon approximation (EPA)", works very well at the low and intermediate energies. However, with energy increasing above the electroweak (EW) scale (v), the photon mixes with Z-boson, which makes the photon PDF not well defined, anymore. Therefore, we would expect that the electroweak bosons come in and make a difference.

In this work, we extend the traditional photon PDF to the EW theory $SU(2)_L \times U(1)_Y$, and define the EW PDFs properly, which includes the gauge bosons $W^\pm$, Z and Higgs scalars as well. Due to the chiral nature of the EW theory, some new phenomena emerge. (a) Due to parity violation of EW interactions, we are not able to factorize the beam or hadronic cross section in an unpolarized way, even for unpolarized beams. Therefore, the polarized PDFs are necessary. (b) In the high energy limit, the conventional PDFs encounter logarithmic violation even at the leading order splitting, which is intrinsically different from QED and QCD. (c) Considering the EW symmetry breaking (EWSB), we need a systematic matching between the high energy asymptotically symmetric phase and the broken phase at low energy.

Summary

Primary authors: XIE, Keping (University of Pittsburgh); MA, Yang (UNIVERSITY OF PITTSBURGH); HAN, Tao (University of Pittsburgh)

Presenter: XIE, Keping (University of Pittsburgh)

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