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Photon PDF within the CT18 global analysis

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Building upon the most recent CT18 global fit, we present a new set of parton distribution functions including the photon content of the proton based on an application of the LUX formalism. In this work, we explore two principal variations of the LUX ansatz. In one approach, which we designate "CT18lux," the photon PDF is calculated directly using the LUX formula for all scales, μ. In an alternative realization, "CT18qed," we instead initialize the photon PDF in terms of the LUX formulation at a lower scale, $\mu \sim \mu_0$, and evolve to higher scales with a combined QED+QCD kernel at $O(\alpha)$, $O(\alpha\alpha_s)$, $O(\alpha^2)$. While we find these two approaches generally agree, especially at intermediate x ($10^{-3} < x < 0.3$), we discuss some moderate discrepancies that can occur toward the end-point regions at very high or low x. We also study effects that follow from variations of the inputs to the LUX calculation originating outside the pure deeply-inelastic scattering (DIS) region, including from elastic form factors and other contributions to the photon PDF. Finally, we investigate the phenomenological implications of these photon PDFs for the LHC, including high-mass Drell-Yan, vector-boson pair, top-quark pair, and Higgs associated with vector-boson production.

Submitted on behalf of a Collaboration?

Yes

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