An Inherent Uncertainty of the Instanton Cross Section Calculation for DIS

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Abstract:
The unique saddle point in the required integrations over the collective (I,$\overline{I}$) coordinates provides a **local** relation between physical subprocess variables (Q', x') in DIS and the size $(\rho, \overline{\rho})$ and $(I, \overline{I})$ distance R

$$\rho = \overline{\rho} \sim \frac{4\pi}{\alpha_s} \cdot \frac{1}{Q'} \qquad\qquad (\frac{R}{\rho})^2 \sim 4\frac{x'}{(1-x')}$$

Hence, the results of the I-cross section calculation in DIS depend crucially on the shape and size of the I-density $D(\rho)$ as extracted from lattice simulations. Throughout, we have used the nice-looking $D(\rho)$ data from the UKQCD collaboration (Smith & Teper '98), which showed a good overall agreement with expectations from I-perturbation theory.
However, these UKQCD lattice data for $D(\rho)$ have recently been shown to be in conflict with the very sensitive upper limits (1.5 pb ..6 pb at 95% CL) for existing I-searches by H1. Using instead the D(rho) data from Anna Hasenfratz and Chet Nieter (Phys Lett. B 439), our predictions become fully compatible with the H1 Instanton search.