Contribution ID: **38** Type: **not specified**

Revised Small-x Helicity Evolution: Numerical Results

Thursday 3 November 2022 18:20 (15 minutes)

Recently, a revised small-x evolution equation for quarks and gluons inside the proton has been constructed to the double-logarithmic order, resumming powers of $\alpha_s \ln^2(1/x)$, with α_s the strong coupling constant. The equation takes into account the observation that the evolution of the sub-eikonal operator, $\overleftarrow{D}^i D^i$, mixes with other helicity-dependent operators from the previous works, which are the gluon field strength, F^{12}, and the quark axial current, $\bar{\psi}\gamma^+\gamma^5\psi$. Based on the new evolution, a closed system of evolution equations can be constructed in the limits of large N_c or large $N_c \& N_f$. (Here, N_c and N_f are the number of quark colors and flavors, respectively.) We numerically solve the equations in these limits and obtain the following small-x asymptotics for the g_1 structure function at $N_f \leq 5$:

$$\mathrm{g}_1(x, Q^2) \sim \left(\frac{1}{x}\right)^{\alpha_h \sqrt{\alpha_s N_c/2\pi}},$$

with the intercept, α_h, decreasing with N_f. In particular, at the large-N_c limit, we have $\alpha_h = 3.66$, which agrees with the earlier work by Bartels, Ermolaev and Ryskin. Once the sixth quark flavor is turned on, i.e. $N_f = 6$, an oscillatory pattern in $\ln\frac{1}{x}$ emerges. However, the oscillation period spans many units of rapidity, making it difficult to observe in an experiment.

Primary authors: TAWABUTR, Yossathorn (University of Jyväskylä); Dr COUGOULIC, Florian (Universidade de Santiago de Compostela); KOVCHEGOV, Yuri (The Ohio State University); TARASOV, Andrey (The Ohio State University)

Presenter: TAWABUTR, Yossathorn (University of Jyväskylä)

Session Classification: Parallel Session B: TMD theory: small x