

Abstract Submitted  
for the APR21 Meeting of  
The American Physical Society

**The Role of the Axial Anomaly in Polarized DIS: Emergent Axion-like Dynamics and the Small X Effective Action** ANDREY TARASOV, Ohio State Univ - Columbus, RAJU VENUGOPALAN, BNL — We discuss the role of the chiral triangle anomaly in deeply inelastic scattering (DIS) of electrons off polarized protons employing a powerful worldline formalism which allows for the efficient computation of perturbative multi-leg Feynman amplitudes. We demonstrate how the triangle anomaly appears at high energies in the DIS "box diagram" for the polarized structure function  $g_1(x_B, Q^2)$  in both the Bjorken limit of large  $Q^2$  and in the Regge limit of small  $x_B$ . We show for the first time that the off-forward infrared pole of the anomaly appears in both limits. We motivate a small  $x$  effective action, consistent with anomalous chiral Ward identities, that shows how non-perturbative effects cancel the infrared pole, leading to an effective axion-like dynamics at small  $x$ . There are two non-perturbative scales that control this dynamics: one is the saturation scale and the other is the pure Yang-Mills topological susceptibility; we discuss how their dynamical interplay can be uncovered in polarized DIS at the Electron-Ion Collider.

Andrey Tarasov  
Ohio State Univ - Columbus

Date submitted: 11 Jan 2021

Electronic form version 1.4