Deuteron Spin Structure at long distance – EG4 with CLAS in Jefferson Lab’s Hall B

• Test chiral perturbation theory ($\chi$PT), the leading approximation of QCD at very long distance (i.e. very low $Q^2$).

• $\chi$PT challenged by earlier JLab data in particular $\Gamma_1$ and $\gamma_0$ moments of spin structure function. Earlier data focused on QCD’s transition between short and long distances ⇒ distances covered not long enough for clean $\chi$PT test. ⇒ New JLab program to measure benchmark spin observables for $\chi$PT in Hall B (experiment EG4) and Hall A.

• EG4: first precise measurement of $\Gamma_1$ and $\gamma_0$ behaviors at large enough distance to unambiguously test $\chi$PT.

Dedicated setup to reach the smallest $Q^2$

⇒ Unprecedented reach and precision on $\gamma_0$ and $\Gamma_1$

Conclusion: No $\chi$PT single method describes well both $\Gamma_1$ and $\gamma_0$. A satisfactory theoretical description of spin observables remains challenging.