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Tensor-polarized structure functions of spin-one deuteron

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There exist polarized structure functions b_{1-4} for the spin-one deuteron. These functions probe very different nature of hadron spin physics from the longitudinally-polarized distributions measured by g_1 for the nucleon. The twist-two structure functions b_1 and b_2 are expressed by tensor-polarized parton distribution functions (PDFs), which indicate unpolarized parton distributions in the tensor-polarized spin-one hadron [1].

First, we investigated the function b_1 in the standard convolution model for describing the deuteron [2]. Using a convolution integral for calculating nuclear structure functions, we obtain the structure function b_1 which is expressed by the lightcone momentum distribution for the nucleon in the deuteron and the unpolarized structure function F_1 for the nucleon. The lightcone momentum distribution is calculated by using a momentum-space wave function for the deuteron with D-state admixture. We found that the function b_1 calculated in this standard description is very different from HERMES b_1 measurements. It suggests that new hadron physics may be needed for explaining the HERMES data.

Second, we investigated the possibility of studying the tensor-polarized PDFs by the proton-deuteron Drell-Yan process in the Fermilab E1039 experiment with the fixed tensor-polarized deuteron target. For pursuing this experiment, it is crucial to estimate the magnitude of a possible tensor-polarization asymmetry theoretically. Using the optimum tensor-polarized PDFs obtained by analyzing the HERMES data, we calculated the tensor-polarization asymmetry by considering the Fermilab kinematics [3]. We found that the asymmetry A_Q is of the order of a few percent. It is a small quantity; however, we believe that it is worth for the measurement to find the physics mechanisms of tensor polarization in the parton level.

Since there is an approved experiment at JLab to measure b_1 and the polarized proton-deuteron Drell-Yan process could be studied at Fermilab, it is an interesting hadron-physics topic with the possibility of creating a new field in high-energy spin physics.

[1] S. Kumano, J. Phys. Conf. Ser. 543 (2014) 012001.
[2] W. Cosyn, Yu-Bing Dong, S. Kumano, M. Sargsian, Phys. Rev. D 95 (2017) 074036.
[3] S. Kumano and Qin-Tao Song, Phys. Rev. D94 (2016) 054022.

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