Contribution ID: **119** Type: **Parallel Session Presentation**

POLARIZATION TEST FOR QUASI-FREE KNOCKOUT OF NUCLEON FROM NUCLEAR SHORT-RANGE CORRELATED NN PAIR

Monday, 18 October 2021 21:30 (20 minutes)

Short-range correlated (SRC) NN pairs play an important role in structure of atomic nuclei and are actively studied using electron and proton beams [1]. Recently the reaction ^{12}C+p→^{10}A+pp+N was studied at BM@N in JINR [2] using the ^{12}C beam at energy of 4 GeV/nucleon interacting with the hydrogen target to probe the SRC pairs {pN} in the ^{12}C. The pp scattering in the subprocess p+{pN}→p+p+N occured at the scattering angles ~ 90° in the pp c.m.s. and all three final nucleons were detected as well as the residual nucleus ^{10}A. For theoretical analysis of this reaction [3] is used a properly modified approach developed earlier [4] to describe the quasi-elastic knock-out of fast deuterons from the light nuclei ^{12}C and ^{7,6}Li by protons in the reactions (p,pd) and (p,nd). A basic assumption in theoretical description of SRC NN correlations in nuclei is a factorization of the two-nucleon momentum distribution in nucleus $n(k_1,k_2)$ over the internal, $n_{rel}(q_{rel})$, and the c.m.s., $n_{cm}(k_{c.m.})$, momenta [1]. For the internal $n_{rel}(q_{rel})$ distribution the deuteron (or singlet deuteron) wave function squared is used for the realistic NN-interaction potentials. Relativistic effects in the quasi-elastic knockout of nucleon from the SRC pair p+{NN}→p+N+N are taken into account in the light-front dynamics [5] similarly to the deuteron breakup reaction p+d→p+p+n. According to the results of the data analysis of the ^{12}C+p→^{10}A+ pp+N reaction [2] the initial and final state interaction (ISI&FSI) with nuclear medium is non-important in the reaction in question at kinematic conditions of the BM@N experiment. Here we estimated the ISI&FSI effects within the eikonal approximation using the Glauber model for the N-^{10}A scattering. The one-loop approximation with elastic N-^{10}A rescatterings was applied and the ISI&FSI effect was found to be moderate. However, another question concerning the mechanism of the subprocess p+{NN}→p+N+N and the role of ISI&FSI in it is much less clear. Only in case of dominance of the quasi-free mechanism (or impulse approximation) of the nucleon knockout in the subprocess p+{NN}→p+N+N one can extract the internal momentum distribution $n_{rel}(q_{rel})$ from the data on the reaction ^{12}C+p→^{10}A+ pp+N. One can show (see Ref. [6] and references therein), that the tensor analyzing power T_{20} of the reaction p+d→p+p+n for the quasi-free mechanism of the nucleon is easily expressed via the ratio u(q)/w(q) of the S- and D- components of the deuteron wave function in the momentum space u(q) and w(q), respectively, and has a very specific behavior as a function of the module of q [6]. Therefore, a measurement of the T_{20} in the reaction p+d→p+p+n at the same kinematics as for the subprocess p+{NN}→p+N+N in the reaction A(p,ppN)B, i. e. at large momentum of the nucleon spectator and large pp-scattering angle ~ 90°, and a subsequent comparison with the results of the IA calculation of the T_{20}, will provide a crucial test for the quasi-free mechanism of this subprocess. A similar test based on the measurement of the T20 of the reaction e+d→ e+p+n can be used to check quasi-free mechanism of the nucleon knockout by electron from the SRC NN pair in the reaction A(e,epN)B.
This work is supported in part by the RFBR grant № 18-02-40046.

1. O. Hen et al., Rev. Mod. Phys. 89 (2017) 045002.
2. M. Patsyuk et al. Nature Phys. 17 (2021) 693; arXiv:2102.02626 [nucl-ex].
3. Yu.N. Uzikov, Izv. RAN, Ser. Fiz. 84 (2020) 580.
4. M.A. Zhusupov, Yu.N. Uzikov, Fiz. El. Chast. At. Yadr. 18 (1987) 323.
5. Yu.N. Uzikov, EPJ Web Conf, 222 (2019) 03027.
6. S.L. Belostotski et al., Phys. Rev. C 56 (1997) 50.

Primary author: UZIKOV, Yuriy (Joint Institute for Nuclear Researches, DLNP)

Presenter: UZIKOV, Yuriy (Joint Institute for Nuclear Researches, DLNP)

Session Classification: Spin in Nuclear Reactions and Nuclei

Track Classification: Parallel Sessions: Spin in Nuclear Reactions and Nuclei