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Possible studies of gluon transversity in the spin-1 deuteron at hadron-accelerator facilities

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In the spin-1 deuteron, there are additional polarized structure functions which do not exist in the spin-1/2 nucleons. Especially, the gluon transversity appears as a new distribution in the deuteron. We proposed to investigate the gluon transversity distribution at hadron accelerator facilities [1]. Although there was recent experimental progress on quark transversity distributions, there is no experimental information on the gluon transversity. The gluon transversity does not exist for the spin-1/2 nucleons due to the helicity-conservation constraint. One needs a hadron with spin more than or equal to one, so that the helicity flip of two units is allowed. In our work, we proposed the possibility for finding the gluon transversity at hadron-accelerator facilities, especially in the proton-deuteron Drell-Yan process, by showing theoretical formalism and numerical results. This Drell-Yan experiment is under consideration in the Fermilab-E1039 experiment. The NICA project could also contribute to this topic. Since the internal spin-1/2 nucleons within the deuteron cannot contribute directly to the gluon transversity, it could be a good observable to find a new non-nucleonic component beyond the simple bound system of nucleons in nuclei.

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