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Title of presentation: QCD mechanisms for accessing the nucleon GPDs with the exclusive pion-induced Drell-Yan process at J-PARC

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Abstract:

Generalized parton distributions (GPDs) encoding multidimensional information of hadron partonic structure appear as the building blocks in a factorized description of hard exclusive reactions. The nucleon GPDs have been accessed by deeply virtual Compton scattering and deeply virtual meson production with lepton beam. A complementary probe with hadron beam is the exclusive pion-induced Drell-Yan process. We discuss recent theoretical advances on describing this process in terms of the partonic subprocess convoluted with the nucleon GPDs and the pion distribution amplitudes [1]. Furthermore, we address the feasibility of measuring the exclusive pion-induced Drell-Yan process, $\pi^- p \rightarrow \mu^+ \mu^- n$, via a spectrometer at the High Momentum Beamline being constructed at J-PARC in Japan [1]. We also discuss the possible soft QCD mechanisms beyond the QCD factorization approach, which could give important corrections at J-PARC kinematics caused by the treatment of the pion pole contribution arising in the relevant GPDs in the ERBL region, the parton transverse momentum to regularize the endpoint singularities, the so-called soft-overlap mechanism, etc., and present an estimate making use of dispersion relations and quark-hadron duality [2]. Realization of the measurement of the exclusive pion-induced Drell-Yan process at J-PARC will provide a new test of perturbative QCD descriptions of a novel class of hard exclusive reactions. It will also offer the possibility of experimentally accessing nucleon GPDs at large timelike virtuality.

References

- [1] T. Sawada, W. C. Chang, S. Kumano, J. C. Peng, S. Sawada and K. Tanaka, Phys. Rev. D 93, 114034 (2016) [arXiv:1605.00364 [nucl-ex]].
- [2] K. Tanaka, in preparation.