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Toward a precision calculation of generalized parton distribution functions.

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Generalized parton distribution functions (GPDs) describe the longitudinal momentum distribution within a hadron among its constituent partons as well as information about the momentum in the transverse direction. We calculate unpolarized and helicity GPDs using 2+1+1 flavors of highly improved staggered quarks in ensembles generated by the MILC collaboration at $a=0.09$ fm with a physical pion mass using the method of large-momentum effective theory (LaMET). We use boosting momentum ~ 1.7 GeV for multiple $\xi = 0$ and $\xi = 0.25$ with multiple transfer momenta renormalized in the hybrid scheme. In addition, we study the effects of systematic errors by applying leading renormalon resummation and renormalization group resummation in the matching process.

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