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Pion and Kaon structure in light front dynamics

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Pion and kaon are one of the simplest meson structures to study the distribution function. In this work, we have calculated the time reversal quark transverse momentum-dependent parton distribution functions (TMDs) in the light-front based holographic model (LFHM) and quark model (LFQM) up to twist-4. We have presented the three dimensional structure of T-even TMDs for both the particles in both models. The transverse structure have been discussed with the help of two dimensional contour plot distribution in momentum space and average quark momenta in both the models. We have taken the overlap representation of LFHM wave function for orbital angular momentum $L_z = 0$ and $L_z = 1$, which makes the calculations more significant. The T-even TMDs have also been compared for both the models and evolved to higher Q^2 to compare with available TMDs extraction data for the case of pion. The collinear parton distribution functions (PDFs) have also been investigated in this work. The unpolarized $f_1(x)$ PDF have been evolved through DGLAP evolution from $Q^2 = 1 \text{ GeV}^2$ to 16 GeV^2 and found significant behavior with experimental results. The inverse moments and Mellin moments have also been discussed in this work. The average longitudinal momentum fraction $\langle x \rangle$ and transverse momenta $\langle \mathbf{k}_\perp^2 \rangle$ of our calculation found to be consistent with other model result.

The spatial structure have also been studied through leading twist GPDs for both the particles in LFQM and have been implicated to understand the form factors (FFs). The FFs found to be consistent with lattice result and experimental result. We have also tried to study the medium modification effect on PDFs in asymmetric matter.

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