

Study of hadronic channels in the $\pi^- + {}^{12}\text{C}$ reaction at 0.69 GeV/c with HADES

Abstract:

This thesis aims to analyze the reaction $\pi^- + {}^{12}\text{C}$ at a pion momentum of 0.69 GeV/c, measured with the experimental set-up HADES at GSI. The pion-nucleus dynamics is poorly understood in this energy range, and such measurements are important for both hadronic matter studies and the detection of neutrinos produced by accelerators in the GeV domain. Inclusive production of π^- , protons, deuterons, as well as different channels, including $p\pi^-$, $p\pi^+$, $p\pi^-\pi^+$, $p\pi^-\pi^+$, $pp\pi^-$, pp , etc., have been explored, and various observables have been compared to the predictions of transport models such as SMASH, RQMD.RMF, GiBUU, and a cascade model used in GEANT, INCL++. This dataset allows for a detailed testing of the description of various processes: quasi-elastic scattering, pion production, rescattering, absorption, in each model. Furthermore, the sensitivity of the measured data for the quasi-elastic process $\pi^- + {}^{12}\text{C} \rightarrow \pi^- + p + X$ to short-range correlations (SRCs) has also been studied.