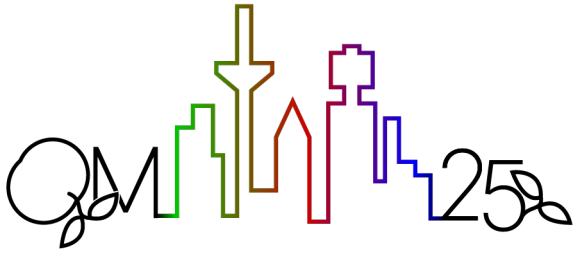

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Hypernuclei reconstruction performance with the CBM experiment

Under the extreme conditions of relativistic heavy-ion-collisions hypernuclei are created with large abundancies. Hypernuclei measurements provide insights into the equation-of-state of hadronic matter at high net-baryon densities, as well as into hyperon-nucleon and hyperon-hyperon-interactions. The Compressed Baryonic Matter (CBM) experiment at the future Facility for Anti-Proton and Ion Research (FAIR) in Darmstadt offers the ideal conditions to explore the production of hypernuclei. The excitation function of hypernuclei production is predicted to exhibit a maximum in the FAIR energy range. In combination with the foreseen high interaction rates of up to 10 MHz, an exceptionally high statistics of hypernuclei will be collected and even very rare double hypernuclei like ${}^{6}_{\Lambda\Lambda}He$ are expected with sizeable statistics.

For the evaluation of the CBM performance with respect to hypernuclei measurements their reconstruction in the 3-body decay channels is especially important as, e.g., it is assumed that the rare ${}^{6}_{\Lambda\Lambda}He$ can decay into three daughters. To evaluate performance indicators like efficiency and signal-to-background ratio as well as the systematic uncertainties of this type of decay, ${}^{3}_{\Lambda}H \rightarrow d + p + \pi^{-}$, which is abundant enough to provide robust results, was studied in detail. Systematical uncertainties were estimated based on simulations with different transport models (e.g. PHQMD), taking into account the extrapolation of the measurements to the full rapidity and transverse momentum range, as well as possible systematic effects of the reconstruction procedures. The experimental sensitivity to properties of hypernuclei, such as their lifetime, was evaluated. In addition, performance studies on the improvement of the reconstruction of ${}^{5}_{\Lambda}He$ by using information provided by the Transition Radiation Detector (TRD) will be shown.

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Category

Experiment

Collaboration (if applicable)

CBM collaboration

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Track Classification: Detectors & future experiments