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CBM performance for (multi-)strange hadron measurements using Machine Learning techniques

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The Compressed Baryonic Matter (CBM) experiment at FAIR will investigate the QCD phase diagram at high net-baryon density ($_B > 400$ MeV) in the energy range of $\sqrt{s_{NN}}$ = 2.7–4.9 GeV. Precise determination of dense baryonic matter properties requires multi-differential measurements of strange hadron yields, both for most copiously produced kaons and Λ as well as for rare (multi-)strange hyperons and their anti-particles.
In this presentation, the CBM performance for the multi-differential yield measurements of strange hadrons (K_s^0, Λ, and Ξ^-) will be reported. The strange hadrons are reconstructed via their weak decay topology using the Kalman Filter algorithm. Machine Learning techniques, such as XGBoost, are used for non-linear multi-parameter selection of weak decay topology, resulting in high signal purity and efficient rejection of the combinatorial background. Yield extraction and extrapolation to unmeasured phase space is implemented as a multi-step fitting procedure, differentially in centrality, transverse momentum, and rapidity at different collision energies. Variation of the analysis parameters allows to estimate systematic uncertainties. A novel approach to study feed-down contribution to the primary strange hadrons using Machine Learning algorithms will also be discussed.

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