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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 ($\mu_B > 400$ MeV) in the energy range of $\sqrt{s_{NN}} = 2.9\text{--}4.9$ 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 estimating systematic uncertainties. A novel approach to study feed-down contribution to the primary strange hadrons using Machine Learning algorithms will also be discussed.

Authors: Mr KHAN, Shahid (Eberhard Karls University of Tübingen, Tübingen, Germany); KLOCHKOV, Viktor (Goethe University Frankfurt (DE)); Ms LAVORYK, Olha (Taras Shevchenko National University of Kyiv); Mr LUBYNETS, Oleksii (GSI, Darmstadt, Germany; Goethe Universität Frankfurt, Germany); DUBLA, Andrea (GSI); Dr SELYZHENKOV, Ilya (3. GSI, Darmstadt, Germany & NRNU MEPhI, Moscow, Russia); FOR THE CBM COLLABORATION

Presenter: Mr KHAN, Shahid (Eberhard Karls University of Tübingen, Tübingen, Germany)

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