

PID in the NICA experiment using machine learning techniques

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Particle Identification (PID) analysis for the Multi-Purpose Detector (MPD) with TPC signals. Data is generated by implementing the MPDROOT software of the NICA experiment. Transporting and track reconstruction for Bi-Bi collisions at center-of-mass energy of 11 GeV is simulated. The PID is computed using a statistical technique (Bayesian Method) for Bethe-Block signal and machine learning techniques (Multi-Layer Perceptron, Decision Tree, Support Vector Machine). All methods have been compared with confusion matrix analysis and ROC-AUC computation. Results display good performance for machine learning techniques at high-momentum ($1.8 \text{ MeV} \leq P < 2.4 \text{ MeV}$) with more than 80% for True Positive (TP) and True Negative (TN) of the classifier prediction, and ROC-AUC > 0.95 . It is demonstrated that the Bayesian Method is inadequate for those ranges of total momentum.

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