Abstract

The ALICE experiment consists of a central barrel and a forward muon spectrometer. Additional smaller detectors for global event characterization and triggering are located at small angles outside of the central barrel. Such a geometry allows the investigation of many properties of diffractive reactions at hadron colliders for example the measurement of single and double diffractive dissociation cross-sections and the study of central exclusive production (CEP). Central diffractive events are defined experimentally by hits in the central barrel and no activity outside of it creating an activity gap in the rapidity observable. The gap condition is further reinforced by the absence of signal in small angle detectors outside the barrel.

Studying *Pythia-8* simulations of these processes shows a drastic reduction of non-diffractive events (background) by enforcing the rapidity gap condition. The remaining background is largely composed of partially reconstructed CEP events, so called feed down events. Often feed down events are accompanied by neutral particles which are not detected. This missing mass and momentum leads to a shift of the invariant mass spectrum to lower masses. This work aims to apply machine learning methods for background suppression of CEP events.

The measured variables *e.g.* the four-momentum of particles, energy loss in the detectors, deduced kinematic quantities, and global event characteristics are in general correlated. To obtain results with maximum precision it is necessary to treat these observables in a fully multivariate way. Furthermore the multivariate approach is suitable also for special cases: *E.g.* if the known models are insufficient and statistical training provides a better description of data which is applicable to this work also. As the process of CEP is still a topic of active research the Monte Carlo simulations are still in development and several observables are not represent accurately in the real data. Multivariate Analysis can be used to investigate the variable space and extract valuable information from it.