XXIV QUARK MATTER DARMSTADT 2014

Contribution ID: **284** Type: **Poster**

Disentangling the soft and hard components of the pp collisions using the spheri(o)city approach

Tuesday 20 May 2014 16:30 (2 hours)

The complexity of the proton-proton interactions requires many theoretical models to describe the different features of the data. Typically, they are incorporated in MC event generators and their parameters are tuned to describe the average behaviour of specific quantities. However, this approach does not allow to understand in detail the impact of the different components in the measurable observables. This task is particularly important to really understand the physics of the hadronic interactions which so far have been taken as the baseline to learn about the medium created in ultra-relativistic heavy ion collisions.

In this work a new method to extract meaningful information from the pp data is proposed, the aim is to use observables sensitive to e.g. partonic stages where collective effects are possible. The approach is based on the use of the event structure variables (sphericity and spherocity). This was developed in the framework of Pythia 8.180 since its pQCD content seems very well adapted for this goal. For minimum bias pp collisions at $\sqrt{s} = 0.9$ and 7 TeV a discussion of the interconnection among event shapes, multi-parton interactions, abundances of final semi-hard quarks/gluons and color reconnection, is done. A study of the identified particle transverse momentum, p_{T}, spectra and their ratios will be presented for isotropic (soft) and jetty-like (hard) events; and as a function of multiplicity. The results indicate that the baryon-to-meson ratio for soft events is larger than for the jetty-like ones, the latter case gives particle ratios compatible with NLO. The observations are explained in terms of the competition between gluons and quarks for the particle production at intermediate p_{T}. The results are compared to LHC data and the similarities between the observed effects and those measured in pp and Pb-Pb collisions are discussed.

On behalf of collaboration:

None

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Session Classification: Poster session

Track Classification: Collective Dynamics