Contribution ID: **126** Type: **Poster or pre-recorded talk**

Forward-backward correlations in proton-proton collisions at the LHC energy: A model based study

Monday 12 July 2021 19:36 (2 minutes)

Forward-backward (FB) correlations of produced particles between symmetrically located pseudorapidity (η) intervals play an important role in understanding the dynamics of multiparticle interactions and their hadronization in different collision systems like hadronic or nuclear. Various experiments including CERN Super Proton Synchrotron (SPS) & the Large Hadron Collider (LHC), the Tevatron, the Relativistic Heavy Ion Collider (RHIC) observed sizeable FB correlation strength in heavy-ion collisions as well as in small collision systems.

In this contribution, we have studied charged-particle multiplicity and summed values of transverse momentum ($p_{\rm T}$) correlations in forward and backward hemispheres in pp collisions at $\sqrt{s}$ = 13 TeV using the Monte-Carlo event generator, EPOS3 [1,2] featuring with and without hydrodynamical evolution of particles. The FB correlation strength is measured in different η window widths ($\delta\eta$) and in different separation between the FB windows (η_{gap}). We have investigated the dependence of FB correlation strength on $\delta\eta$, η_{gap}, and different multiplicity classes. Due to unavailability of experimental data for the FB correlations at $\sqrt{s}$ = 13 TeV, we compared our results with the predictions from the Quark-Gluon String Model (QGSM) [3], which suggests that the general trends of FB correlation strength for both EPOS3 hydro and without hydro simulated pp events at $\sqrt{s}$ = 13 TeV are similar to that of QGSM [3]. Our previous analysis on EPOS3 generated pp collisions at $\sqrt{s}$ = 0.9, 2.76 and 7 TeV [4] also reveals similar behavior. Thus, the manifested similar behavior in FB correlation strength for hydro and without hydro events suggests that the analysis may not be much affected by the hydrodynamical evolution of bulk particles rather it may be due to multiparticle interactions and fluctuations.

Moreover, it is interesting to note that FB correlation strength tends to saturate at very high energy which is evident from the dependence of $\delta\eta$ weighted average of FB correlation strength with center-of-mass energies ($\sqrt{s}$ = 0.9, 2.76, 7 and 13 TeV). Thus, our study on FB correlations adds valuable information to understand the dynamics of particle production at LHC energy as well as encourages more experimental measurements in this direction.

References:
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Preferred track

Collectivity & Multiple Scattering

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Session Classification: Poster Session