Particle production at the LHC: Predictions from EPOS

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Heavy Ion Collision at LHC
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EPOS MODEL

- Quantum mechanical multiple scattering approach based on partons and strings
- Cross sections and particle production calculation in the same framework with energy conservation
- Careful treatment of projectile and target remnants
- Contains nuclear effects: splitting of parton ladders (screening)
- High density effect: treatment of collective effects of a dense core

See K. Werner talk on 7th of June
Parton ladders: soft or hard interaction

Multiple interaction: exchange of parton ladders in parallel with care of energy conservation
Collective Effects of the Dense Core

Modification of the string procedure

Corona = low density part, usual EPOS particle production

Core = dense area, hydro-like expansion

Define a freeze out hypersurface: transition from strongly interacting matter to freely streaming hadrons.

Actually parameterized in EPOS

Important also in pp scattering
Proton-Proton: pseudorapidity distributions and Pt spectra

Full line: mini plasma option  Dotted: conventional
Proton-Proton: Pt dependance of particle ratios at \( \eta = 0 \)
Proton-Proton: average $p_t$ at $\eta = 0$
Lead-Lead at 5.5 TeV: centrality dependence of particle yields.

Graphs showing the dependence of charged particles (charged), pions ($\pi^+$), kaons ($K^+$), anti-protons ($\bar{p}$), lambda ($\Lambda$) on the number of participant nucleons ($N_{\text{part}}$) for the PHOBOS experiment.
Lead-Lead at 5.5 TeV: pseudorapidity distributions at different centralities
Lead-Lead at 5.5 TeV: Pt distributions at $\eta = 0$
Lead-Lead collisions at 5.5 TeV: Raa at $\eta = 0$
Conclusion

Proton-Proton

“mini-plasma option” influence results, particularly for particle ratios such as $\Lambda/K^+$

Multiplicity dependence of $P_t$

Some collective effect already in $pp$

Lead-Lead

$R_{aa}$: curves well below one: strong screening effect,
BUT: one have to keep in mind the non-triviality of $pp$
Lead-Lead at 5.5 TeV: V2 at 5.5 TeV for minimum bias collisions