Dihadron angular correlations in PbPb collisions with HYDJET++ model

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The hybrid model HYDJET++, which includes soft and hard physics, is employed for the analysis of azimuthal anisotropy harmonics and dihadron angular correlations measured in PbPb collisions at √s_{NN} = 2.76 TeV. The soft part of the model represents a thermal hadron production at the freeze-out hypersurface in accordance with hydrodynamical calculations. The possible triangular shape fluctuation of the initial overlap density of the colliding nuclei was implemented in HYDJET++ by the modulation of the final freeze-out hypersurface with the appropriate triangular coefficient, which results in triangular flow \( v_3 \).

Along with elliptic flow \( v_2 \), it generates higher order flow coefficients, as well as a specific structure of dihadron angular correlations on relative azimuthal angle in a broad range of relative pseudorapidities (\( ΔφΔη \)). The comparison of model results with the LHC data on short- and long-range angular correlations is presented for different collision centralities and transverse momentum intervals.

HYDJET++ model

1. Hard part
   - Initial parton configuration
   - Initial hadronization
   - Hadronization
   - Parton recombination & energy transfer

2. Soft part
   - Hadronization at freeze-out stage with distribution function:
   - Flow ($v_2$, $v_3$)
   - Space modulation of freeze-out surface:
   - and modulation of 4-velocity at freeze-out stage:

Flow
- Due to jet quenching.
- Only elliptic flow.

Flow and dihadron correlations:
- Short-range correlations only in PbPb collisions.
- HYDJET++ describes data.
- Test of factorization: \[ V_{ij} = v_2(z_2)p_T(z_2)v_3(z_1)p_T(z_1) \]
- It is found that \( j \) correlation from PYTHIA simulation of \( jj \) collisions also approximately factorizes.

CONCLUSIONS:
- In HYDJET++ single-particle flow \( v_2 \) and \( v_3 \) are tuned to describe data at low \( p_T \).
- The resulting from \( v_2 \) and \( v_3 \) interference higher order flow harmonics describes data at semi-central collisions well but underestimate data at more central events.
- Similarly it has been found that dihadron correlations (both long-range and short-range) are described well at semi-central collisions.
- The factorization of Fourier coefficients of dihadron correlation onto single-particle flow coefficients at low \( p_T \) may be fulfilled also in a presence of non-flow (or other than flow sources of correlation).