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# Spheroid expansion and freeze-out geometry heavy-ion collisions in the few-GeV energy regime

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Models based on statistical hadronisation were found to be applicable for ultra-relativistic heavy-ion experiments where high nucleon transparency is present. It is not well established whether such models are also valid for the part of the QCD diagram where the collision energies are lower (of the order of a few GeV). In our previous work, by implementing spherical fireball geometry and expansion shape corresponding to the few-GeV regime into the THERMal heavy IoN generATOR (THERMINATOR), it was possible to replicate experimental distributions of transverse-mass with satisfactory accuracy. However, rapidity distributions came out narrower than measured experimentally, which suggests a deviation from the spherical symmetry. In our current work, we introduce the spheroidal symmetry of the fireball, which in turn allows to reproduce well the rapidity distributions of the most abundant particles measured by the HADES collaboration in Au+Au 10% central collisions at $\sqrt{s_{\mathrm{NN}}} = 2.4$ GeV. We use measured particle spectra and femtoscopic correlations to constrain the parametrization of the shape and the expansion profile of the fireball. Moreover, in the light of recent publications analysing this topic, we extend our study to discuss different formulations of the statistical hadronisation models, aiming at a better understanding of the statistical nature of particle production in heavy-ion collisions.

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