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A strong influence of weak decays on chemical freeze-out parameters of hadrons measured in high energy nuclear collisions found within the advanced Hadron Resonance Gas Model

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The advanced Hadron Resonance Gas Model (HRGM) which correctly accounts for the sequentialstrong and weak decays is developed. Our analysis of the STAR experiment data on hadronicmultiplicities demonstrates that taking into account for the weak decays is extremely important tohave a model that can describe the data with very high accuracy.
We report our results on fitting the particle yields measured at midrapidity in central nuclearcollisions by the STAR Collaboration during the Beam Energy Scan I (BES) program for the centerof-mass collision energies $\sqrt{s}_{NN}$ = 7.7 − 200 GeV using an advanced HRGM based on the inducedsurface tension equation of state [1, 2] with the multicomponent hard-core repulsion.
Two fitting schemes are used: with and without weak decays. The chemical freeze-out (CFO)parameters extracted from the fit show a significant influence of weak decays on the fit quality.Moreover, their inclusion into the analysis of BES I data leads to decreasing the CFO temperatureof hadrons by about 10–15 MeV. For the highest RHIC energies of collision the new CFOtemperatures of hadrons, for the first time, are in complete agreement with the ones obtained earlierfor the ALICE energy $\sqrt{s}_{NN}$ = 2.76 TeV [2, 3]. Furthermore, it is found that the new CFOtemperatures of hadrons practically coincide with the lattice QCD results on pseudocriticaltemperatures at small values of baryonic chemical potential. Remarkably, it is shown that the CFOparameters of light (anti-, hyper-) nuclei obtained in [3] are not affected by these modifications.

References:
[1] K. A. Bugaev et al., Nucl. Phys. A 970, (2018) 133–155.
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