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Resonances in a sudden chemical freeze-out model

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A chemical non-equilibrium model with a single freeze-out appeared to be rather successful in describing the LHC ALICE data at 2.76 TeV for various particles [1,2]. The pT spectra of pions, kaons, protons, $K^*(892)^0$ and the $\phi(1020)$ are described by the same hubble-like freeze-out hyper-surface that has only one parameter for the slope of the spectra – the ratio of the freeze-out time to the freeze-out radius [1,2]. This is very surprising for the $K^*(892)^0$ and the $\phi(1020)$, because the first one is short leaving, while the second one is long living. The description of both of them may question the necessity of the long re-scattering phase, which is also successfully used to describe the ALICE data [3]. It may also indicate that the non-equilibrium, as implemented in [1,2], may effectively include the re-scattering in the non-equilibrium chemical potentials. It is important to differentiate between the equilibrium with the re-scattering, and the single sudden freeze-out in the non-equilibrium, because the non-equilibrium also leads to pion condensation [4].

A good test for the non-equilibrium single freeze-out scenario [1,2] is the comparison to different resonances, especially strange resonances, because this scenario requires a special relation between the strange and the non-strange chemical potentials, depending on the quark content of a resonance. The heavy Λ Ξ and Ω can be still described by the non-equilibrium very well, if one assumes a smaller slope for them [2]. This introduces the dependence on the mass of the resonance, but is also supported by smaller flow of heavy particles in other approaches, see e.g. [4].

In this work, the predictions for the mean multiplicities and the pT spectra of various strange resonances are made, including the $\rho(770)$, $\Lambda(1520)$, $\Xi(1530)$ and $\Sigma(1385)$.

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List of tracks

Hadron resonances

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