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Fluctuations of the freeze-out temperature in Pb-Pb collisions at LHC

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Many data in the High Energy Physics are, in fact, sample means. It is shown that when this exact meaning of the data is taken into account and the most weakly bound states are removed from the hadron resonance gas, the acceptable fit to the whole spectra of pions, kaons and protons measured at midrapidity in central Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV is obtained. The invariant distributions are predicted with the help of the Single-Freeze-Out Model (SFOM) in the chemical equilibrium framework. The new idea introduced into the SFOM in this work is to randomize one of the parameters of the model. It has turned out that the successful improvement is achieved only when the freeze-out temperature becomes a random variable and nothing is gained with the randomization of geometric parameters of the model. Low p_T pions and protons are reproduced simultaneously as well as p/π ratio. Additionally, correct predictions extend over lower parts of large p_T data. The method is applied to other centrality bins of Pb-Pb collisions and the results are also presented. Some more general, possible implications of this approach are pointed out.

Based on: D.Prorok, "Single Freeze-Out, Statistics and Pion, Kaon and Proton Production in Central Pb-Pb Collisions at $\sqrt{s_{NN}} = 2.76$ TeV", J. Phys. G: Nuclear and Particle Physics **43** (2016) 055101.

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