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Opponent's review of the the Master's thesis by Bc. Jaroslav Štorek: „**Study of equilibration of charm mesons in relativistic heavy ion collisions within Monte Carlo generator HYDJET++**“

The master's thesis is devoted to the study of various characteristics of charm mesons production in heavy ion collisions at high energies. Jaroslav Štorek employs HYDJET++ model for this purpose, which is actively used both by experimentalists for detector performance study and by theoreticians for phenomenological analysis in heavy ion collisions.

The main interest of heavy ion collisions at high energy is to explore the nuclear matter under different conditions, phase transition to quark-gluon matter and its properties. J. Štorek gives a very good introduction to the physics of ultra-relativistic heavy ion collisions, and presents main theoretical principles of hydrodynamic approach to describing evolution of created matter.

The evidence of quark-gluon matter formation as well as its properties one can only determine via final state observables. So, in the second chapter the very clear and good overview of quark-gluon plasma signatures is presented. Some of selected main signatures are described in details with very well knowledge of the latest experimental results and their interpretation.

The main part of the thesis is dedicated to charm meson production and the issue of their thermalisation in quark-gluon matter. This was investigated for Au+Au collisions at the center-of-mass energy 200 GeV per nucleon pair, Pb+Pb collisions at 2.76 and 5.02 TeV per nucleon pair. The great work was done in phenomenological modeling of yields, collective flow and nuclear suppression factor of charm mesons. For the first time it was done at c.m. energy 5.02 TeV, which suggests testing and tuning model parameters. This research required also software analysis and high statistics of simulated events. The author shows very good technical skill in this area. Jaroslav Štorek also studied and implemented some of the experimental techniques for collective flow measurements in his analysis, which is yet another advantage of the work.

Comments and questions:

1) The authors uses comparisons with experimental data from detectors at LHC (CERN) and at RHIC (BNL). May be it would be worth to include very general description of experimental setups.

2) The histograms with fluctuating points (like Fig.4.11) could be re-binned for better visualization.

3) The global comment is that in many places the articles “a” and “the” are missing.

4) The author mentions discrepancies in elliptic flow results for charged hadrons in Au+Au collisions between the old and the updated version of HYDJET++ model. Please note, that the new version may require different values of two parameters for anisotropy, which user can set manually or use automatically calculated ones. Why this particular set of parameters was used and also did you try to use automatic calculations of parameters in order to improve flow results?
Which parameters for charm meson elliptic flow were used?

There is also some small overestimation of the data on pseudorapidity distribution on Fig. 4.1, right. The authors uses the comparison with BRAHMS data. Which momentum cut was used to reproduce the data? Note, that older version of the model shows very good agreement with PHOBOS data, as can be seen from cite [88] of the Thesis.

5) Which method was used for elliptic flow calculations for J/Ψ-mesons for Pb+Pb collisions? What non-zero flow means in regards to equilibration study?

In general, the thesis is very well written, structured, a vast number of references is used. A remarkable work was done on technical side as well as for physical analysis of the results. The thesis definitely deserves the grade **A(excellent).**

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