



OPPONENT'S REPORT ON THE MASTER'S THESIS

Author of the thesis: Bc. Tomáš Truhlář

Title of the thesis: Study of $\pi^+\pi^-$, K^+K^- , $p\bar{p}$ and $\pi^+\pi^+\pi^-\pi^-$ production in central exclusive processes with the STAR detector at RHIC

This thesis deals with analysis of central exclusive production data (CEP) from the STAR detector at RHIC collider. The search for glueballs candidates through double Pomeron exchange mechanism is very interesting measurement and important test of the QCD theory and one of the possible windows to new physics. The data from STAR experiment gives unique opportunity for these searches and thus, the measurement done by the author is very actual and makes scientific contribution.

The text is well written in English with only few typographical or logical errors that does not prevent the reader from understanding. I give positive remarks for diligent citation and graphical form of the thesis. From my point of view, it very important (and positive) that the author clearly describes what was his work in the analysis and which figures are taken from literature and which were made by the author, either for this thesis (not approved for public presentation) or for public presentation (approved by the STAR collaboration). The structure of chapters and sections could have been improved – for example Chapters 5 and 7 logically belong under Chapter 4 as sections (or there should be clearly named chapters for two hadron and four hadron CEP channels). Sections 6 and 8 could have also merged, but those are only minor comments.

Author made a good overview of the status of the CEP measurements (recherche part) and performed first analysis of the CEP at $\sqrt{s} = 510$ GeV (practical part). The author himself presented the work in form of a poster at ICHEP2020 – the biggest high-energy physics conference. That is quite an achievement for master thesis. The analysis obviously is not finished yet, the systematical uncertainties evaluation and comparison to more MC models are missing, and some parts needs more tests to better understand some features, but that would be a task for Ph.D. thesis (and this work is a very good starting point for Ph.D. thesis). Main results are similar to recently published STAR $\sqrt{s} = 200$ GeV paper (as discussed in the thesis properly), but author also made innovative contribution with $\pi^+ \pi^- \pi^+ \pi^-$ channel and comparison to Graniitti MC – both need more work and tuning, but already shows promising results. Fig. 4.3. left has wrong label (four hadron channel instead of 2 hadron).

My questions:

- The TPC and TOF inefficiencies mentioned on page 36 (and shown in Fig 4.6) – do they have any influence on the result (are the bad quality data?) or you can use the data (and expecting to lose some good events)? In the latter case do you need to include these inefficiencies to MC/STARsim?
- Can you show some comparison to STAR $\sqrt{s} = 200$ GeV result? It has been discussed in the thesis but seeing figures next to each other would be more helpful.
- Fig. 3.1. shows p+p data with $\sqrt{s} = 500$ GeV with similar luminosity to 510 GeV and 200 GeV data – are they being analyzed as well?

I recommend the thesis for the defense and I propose the evaluation A (excellent).

In Prague, 2 September 2020

Ing. Kamil Augsten, Ph.D.
CTU in Prague, FNSPE