

Review of the dissertation submitted by Ing. Roman Lavička

Ultra-Peripheral Collisions at ALICE

The dissertation is devoted to the experimental study of the coherent photoproduction of J/ψ meson in ultra-peripheral collisions of lead nuclei measured by ALICE experiment at CERN LHC. This study is quite pioneering in several aspects in my view. Firstly, it exploits the new possibilities opened by ultra-peripheral collisions of the high energy charges with their clouds of virtual photons around. Secondly, it looks for the dimuons in the central rapidity region and does not use the ALICE muon spectrometer that could be considered as a “natural” tool for studying quarkonia. I appreciate the use of unfolding to get the t dependent differential production cross section, well comparable with theoretical models and potential other experiments.

The methods used are appropriate and the study clearly passed the internal quality review of ALICE experiment to be published as the collaboration papers (reprinted as an appendixes) and to be presented at the ICPPA-2018 conference. I consider the results to be interesting, valuable and giving courage for further research in that direction. This is a compliment both to the author and to the supervisor.

The dissertation is written in a well readable English with negligible amount of misprints, in an exceptionally pleasant graphical form and generally concise formulations. I have only few minor comments:

- The title is quite general, what is a good starting point at the beginning, but could be particularized as the work is finished.
- The sentence in the abstract: “The main task is to calculate ...” is quite misleading in my view; clearly the unfolding needs a lot of calculations, but the result is experimental.
- I missed any comments on the *pomeron* in chapter 2 and so I was surprized by Fig. 2.5 without any context.
- The definition of Crystal-Ball function on page 73 seems to me quite late, as it is first discussed in paragraph 5.2, page 53.

I will appreciate short comments or explanations to following

- Figs. 2.4 and 2.5: The p_T spectra from experiment visibly differ from the MC signal only, does the MC describe well the background?
- To believe the Bayes unfolding, could you comment on the study depicted in Fig. 4.3, page 48?
- What means $M_{J/\psi} = 3,103 \pm 0,000 \text{ GeV}/c^2$ in Fig. 5.2, page 53?

To summarize: In my view the dissertation is excellent with valuable published results, it illustrates that the author did a lot of work and acquired a lot of experience within the ALICE experimental community, showed that he is capable of a valuable scientific activity. I have no doubts that he could be awarded the degree of PhD.

Prague, June 18th, 2021

Assoc. Prof. RNDr. Jiří Dolejší, CSc.

IPNP, Faculty of Math. And Physics, Charles University