

Posudek školitele na doktorskou disertační práci

Doctorand:

Roman Lavička

Title of dissertation:

Ultra-Peripheral Collisions at ALICE
Looking inside lead ions

Supervisor:

prof. Jesús Guillermo Contreras Nuño, Ph. D.

Supervisor specialist:

Mgr. Michal Broz, Ph.D.

Recommendation:

The work fulfils all the requirements to be presented as a doctoral thesis

The main result of this dissertation is the first measurement of the cross section for the photonuclear production of J/ψ as a function of the Mandelstam variable t . This measurement opens a new chapter in the studies of the structure of heavy nuclei in the high-energy limit by accessing an observable that maps the transverse structure of the gluon distribution in Pb ions.

In addition to this important result, the student also participated in two other measurements. One related to the same physics but exploring different kinematic dependences of the process. The second additional result where the student was involved is the determination of the luminosity in Pb-Pb collisions in ALICE. The corresponding paper will be the first LHC paper on this topic. (At this moment, the paper is going through the internal ALICE process towards submission.)

The dissertation is structured as follows: a short text to set up the stage is presented in the Preface, which is followed by an introductory chapter where the key concepts related to the measurement are briefly described. Chapter 2 is devoted to the ALICE experimental set-up. The determination of the luminosity is the subject of Chapter 3, while unfolding is discussed in Chapter 4. Chapter 5 introduces the formalism related to the measurement of the cross section. The results are discussed in Chapter 6. The summary and outlook are presented in Chapter 7. This is followed by a detailed description of the contributions of the Author in the framework of the ALICE collaboration, and appendices containing the text of the three articles produced during these doctoral studies.

The student developed by himself all the tools needed to obtain the results presented in the dissertation. He was involved in the technical aspects as well as in the physics discussions. He headed the team that wrote and pushed through the collaboration the main result mentioned above, and is part of the other two teams in charge of writing and publishing the other two results. As part of his doctorate, the student also fulfilled several important tasks as member of the collaboration and his work, particularly that related to the luminosity framework, is of extreme utility to Run and Trigger coordinators.

In summary, the work of the student is of excellent quality in all fronts (technical, analysis, physics) and his production is above average. The main result attests his creativity and capability of impacting the development of the field. The work easily fulfils all the requirements to be presented as a doctoral thesis

prof. Guillermo Contreras
Faculty of Nuclear Sciences and Physical Engineering,
Czech Technical University in Prague

Prague, May 25, 2021.