

Frascati, 11th August 2015

To: Dean's Office
Faculty of Physics Astronomy and
Applied Computer Science
Jagellonian University in Krakow
Ul. Łojasiewicza 11

**Proposal and motivation of distinction award
for the Ph. D. thesis of Ms. Magdalena Skurzok**

I reviewed and evaluated the doctoral thesis of Ms. Magdalena Skurzok, entitled "*Search for η -mesic helium via $dd \rightarrow {}^3\text{He} \, n \, \pi^0$ reaction by means of the WASA-at-COSY facility*", realized under the supervision of prof. dr. hab. Paweł Moskal.

The thesis presents the results of an original and very important study, related to the search for the ${}^4\text{He}$ - η bound state in the $dd \rightarrow {}^3\text{He} \, n \, \pi^0$ reaction in the data measured with the WASA detector at COSY, using a deuteron beam with momentum varied continuously in the 2.127 GeV/c to 2.422 GeV/c region and a deuteron pellet target.

Magdalena Skurzok has performed a remarkable work within her Ph D, which allowed to determine, for the first time, the excitation function for the $dd \rightarrow {}^3\text{He} \, n \, \pi^0$ process. No clear signal was observed, but upper limits for the cross section of the η -mesic ${}^4\text{He}$ formation and decay were extracted for $dd \rightarrow ({}^4\text{He}\eta)_{\text{bound}} \rightarrow {}^3\text{He} \, n \, \pi^0$ studied process. The upper limit varies from 21 to 36 nb for the width varying from 5 MeV to 50 MeV, being a factor of 5 larger than the theoretically estimated value for this reaction. Even if the result obtained in the thesis does not exclude the existence of ${}^4\text{He}\eta$ bound state in the considered process, this result is very important, showing the way to obtain in the near future a result which could either confirm or deny the existence of this mesic bound state.



The results Magdalena Skurzok obtained during the work for her Ph. D. thesis has produced several publications in refereed journals, which are very important for all those working in the field of non-perturbative QCD and the possible existence of mesic-nuclei. She, moreover, presented the results in various meetings and workshops.

The description of the results in the thesis is very clear, with a proper citation of references.

The methods and the approach are very well presented, proving that Magdalena Skurzok is a mature and gifted scientist, able to give original contributions important for a rather large community composed of theoreticians and experimental researchers.

I consider the results of the thesis and its presentation as being excellent and propose to assign to Ms Magdalena Skurzok the Ph. D. with the highest (excellent) distinction.

Dr. Catalina Oana Curceanu



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