Supervisor's statement of a final thesis

Student: Tomáš Chobola

Supervisor: doc. Dr. André Sopczak

Thesis title: Study of light-by-light scattering with the ATLAS Forward Proton (AFP) Detector at CERN

Branch of the study: Knowledge Engineering

Date: 4. 6. 2020

Evaluation criterion:	The evaluation scale: 1 to 4.
1. Fulfilment of the assignment	**_1 = assignment fulfilled,_** 2 = assignment fulfilled with minor objections, 3 = assignment fulfilled with major objections, 4 = assignment not fulfilled

Criteria description:
Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.

Comments:
Tomas addressed each point of his assignment very thoroughly. As the tasks related to an ongoing research project, Tomas adapted his contribution and to the needs of the developing research. His introduction and application of the Gaussian Process was an excellent way how to describe the data. This part has also been challenging from the theoretical point of view, and lead to the better description of the data compared to a standard functional fitting method. Bringing this new approach to the analysis was Tomas idea and the application was very well implemented and applied on several sub-data sets with significantly different data statistics. The theory behind is approach is very nicely described in the thesis. The thesis part on the event generator was the start of his contribution and from the code development side is the least challenging, as he performed very efficiently on this part, more challenging tasks with the data description (background) and significance determination for a hypothetical signal were addressed and Tomas developed the code efficiently and scientifically rigorously.

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
2. Main written part	95 (A)

Criteria description:
Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies? Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 26/2017, Art. 3. Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

Comments:
The thesis is concise and the content addresses all aspects in the required detailed.Tomas did several cross checks to ensure the correctness of the results. His results have also been checked for obvious mistakes and all parts are found to be correct. The thesis is very well structured and comprehensible to the reader. It has been a challenge to avoid or explain specific terms used in particle physics, and he has done well as far as I can see from the view of a particle physicist. The English is excellent and the language fulfills high scientific standards. The citations are adequate, and cover both specific items and general overview descriptions. The software used and previous related work is corrected quoted where appropriate.

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
3. Non-written part, attachments	90 (A)

Criteria description:
Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

Comments:
The tools employed are well chosen and Tomas showed initiatives to extend the software as needed. Important was his adaptation of the software and testing and cross-checking that confidence with the results was achieved. The tools regarding the event generation, data description and significance determination were fully adequate for scientific sound results.

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
4. Evaluation of results, publication outputs and awards	*90 (A)*

Criteria description:
Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

Comments:
His contribution is an important part of an ongoing research in a larger research team. His results were presented on several occasions in experts meetings at CERN and were accepted as correct. Comments and suggestions received Tomas implemented in an iterative process leading to the current results. Tomas contribution will implemented in a publication. The time-scale for CERN (ATLAS experiment) publications is long because of a extended scrutiny process, therefore a publication including Tomas' results will only follow in the future. Besides his thesis work, Tomas documented well all aspects in a so-called internal supporting note which accompanies any ATLAS publication.

Evaluation criterion:	The evaluation scale: 1 to 5.
5. Activity and self-reliance of the student	5a: **1 = excellent activity,** 2 = very good activity, 3 = average activity, 4 = weaker, but still sufficient activity, 5 = insufficient activity 5b: **1 = excellent self-reliance,** 2 = very good self-reliance, 3 = average self-reliance, 4 = weaker, but still sufficient self-reliance, 5 = insufficient self-reliance.

Criteria description:
From your experience with the course of the work on the thesis and its outcome, review the student's activity while working on the thesis, his/her punctuality when meeting the deadlines and whether he/she consulted you as he/she went along and also, whether he/she was well prepared for these consultations (5a). Assess the student's ability to develop independent creative work (5b).

Comments:
Tomas has shown very good potential as scientific researcher.

Evaluation criterion:	The evaluation scale: 0 to 100 points (grade A to F).
6. The overall evaluation	*90 (A)*

Criteria description:
Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.

Comments:
Tomas thesis described challenging scientific work, where his software skills were demanded. The results and way how they were obtained are very clearly presented in excellent English. Tomas showed much initiatives and good ideas. Scientifically his work was checked and his time-management for his thesis completing was good that enough time for the finalization remained.

Signature of the supervisor: