

## Reference letter on PhD thesis “Measurement of the inclusive jet cross-section with the ATLAS detector” by Vojtech Pleskot

The thesis presents the measurements of the inclusive jet cross-section using data collected by the ATLAS experiment in 2011 and the in situ validation of the Tile Calorimeter cell energy correction for non-operating modules in the same data-taking period.

The thesis is written in a clear way. It contains theoretical introduction, description of the ATLAS detector and details the jet energy scale calibration procedure adopted by the ATLAS Collaboration in 2011. The main results on the thesis are described in two dedicated sections, where Author presents original studies and solutions, and are summarised in the “Conclusions” section. The division in sections allows for a fluent reading of the thesis material and better understanding of the results.

The Tile Calorimeter cell energy correction for non-operating modules, described in Section 3, allows the events with jets pointing into these modules to be used for physics analyses. Author has studied the performance of this correction and validated it using in situ techniques. He has demonstrated that the detector simulation describes data in these problematic regions with reasonable accuracy. Moreover, he proved that the impact of the non-operational Tile modules on the measurements of the inclusive jet cross-section is negligible.

The measurement of the jet production in the multi-TeV regime is the most interesting and new result of the thesis, since it provides a stringent test of the validity of the Standard Model at the shortest available in the laboratory distances and it was not measured before. I would like to emphasize that Author performed a numerous consistency checks to make sure, that the reported measurements are properly unfolded from the detector effect. I also find very interesting the derivation of the systematic uncertainties in the inclusive jet cross-section using the re-sampling method, which allows to correctly estimate the statistical component in the systematic uncertainty and to remove it from the final result. A special attention deserves the study of the quantile levels in the measurement uncertainties, which is new to the field and will definitely be used by the PDF fitters groups for the determination of the gluon content of the proton.

The results of the measurements of the inclusive jet cross-section are already published in the “Journal of High-Energy Physics”. While the studies of the had cell energy corrections have been already used in many ATLAS analyses with jets in the final state, they are also published as a part of the jet energy scale calibration paper in the “European Physics Journal C”.

Hereafter, I have several comments on the thesis content:

- Author almost never uses commas in the text of the thesis.
- I would rather make the results, presented in Appendix A, to the main part of the thesis.
- The references in the bibliography are not presented in a uniform way. Eg, [31] uses “et al.” notation, while [32] - “and others”; [27] introduces names of the authors, while [28] - does not.

- In the event selection for the bad cell energy correction, described in Section 3, the triggering is done in  $p_T^{\text{vis}}$  bins. Would it not introduce a bias in the trigger selection, since one of the jets is supposed to fall into a region with non-operating modules?
- Two different correlation scenarios, “weaker” and “stronger”, are introduced in Section 4. It is important to know which (and why) components of the nominal jet energy scale uncertainty are considered to be correlated/uncorrelated in these scenarios.

In spite of these remarks, my general impression from reading this thesis is very positive. The presented results are new and very interesting. They are of great importance for the high-energy physics community. For example, these measurements can be further used in studies of the proton structure at the high momentum transfer and momentum fraction ranges and for searches for “new physics” phenomena.

In summary, I think, that thesis “Measurement of the inclusive jet cross-section with the ATLAS detector” presents valuable contribution to the experimental high-energy physics and concludes high-quality scientific work performed by the candidate. The Author has demonstrated deep knowledge in both theoretical and experimental aspects of particle physics and high skills in solving scientific problems. In my opinion, Vojtech Pleskot certainly deserves the Ph.D. title.

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