

## Review of the thesis „Inclusive production of b jets in collisions of p-Pb and pp in ALICE” by Artem Isakov.

The dissertation thesis by Artem Isakov is primarily dedicated to the analysis of b jet production in proton-proton and proton-lead collisions at the LHC performed using the ALICE experiment. In addition to that, thesis also summarizes author's work on quality control software designed to monitor the performance of new inner tracking system of ALICE. The thesis starts with the theoretical introduction discussing the Standard Model, QCD, jet physics and physics of proton-lead collisions. After this, the ALICE experiment is introduced in Chapter 2. Chapter 3 is the center of the thesis describing the b jet analysis. Chapter 4 and 5 summarize the ALICE upgraded performed after the end of Run 2 and author's contribution to the quality control software.

The whole thesis is well written, in a clear language. In particular, Chapter 1 presents a clear and well legible introduction. In general, I found only minimal number of typos. One of them is an inconsistent use of the correct center of mass energy of run 2 heavy-ion collisions, i.e. 5.02 TeV instead of just 5 TeV (others: page 16: "since because", Fig.1.14, caption: repeating "left panel"). Sometimes definitions are missing (nSD, HMPID, QA).

The most important part of the thesis is the b jet analysis. The analysis was fully preformed by the author of the thesis and it was published in journal JHEP. The analysis is well described and it contains all the necessary steps: evaluation of b tagging performance, unfolding, MC tests, calculation of systematic uncertainties, calculation of final observables and combination of results from method using secondary vertices with method using the impact parameter to tag the b jets. Despite that the analysis has been published in high quality journal, I would still have several questions and comments which I'd like to be addressed by the author during the defense of the thesis:

- a) Why Pythia MC is embedded into simulation of nuclear environment from EPOS instead of embedding it into real minimum bias data as done by other LHC experiments? Do you have a study which would prove that resolutions induced by underlying event from EPOS are identical to those in the real data?
- b) Is the response re-weighted by measured distributions to achieve a better prior? This is usually done. PYTHIA8+POWHEG seems not to characterize well the real measured data.
- c) The response is factorized and a part is estimated using simulation with single particles. How to make sure that the procedure with single particles in MC correctly reflects what is happening with jets in the data? Wouldn't it be more straightforward to overlay MC jets into real minimum bias p+Pb data, avoid using single particles and the assumed factorization of response? This is a procedure done in other experiments?
- d) How are the statistical uncertainties evaluated? Using pseudo-experiments? SVD often suppresses statistical fluctuations in the data delivering smoothly looking distributions, but one needs to make sure that this feature of SVD is correctly covered by uncertainties. This may be what is responsible for "outliers" in Fig.3.30 for the Bayesian unfolding. Would you agree?
- e) Variation of binning scheme to access the systematic uncertainties seems ad-hoc, since it is essentially a change in the analysis definition. What drives this alternative binning? Are there some exact criteria?

f) Why is there as much as three types of MC samples used in the analysis to estimate the performance? There are: PYTHIA6 (kind of obsolete by now) + EPOS (which is not the same as p+Pb minimum bias data), PYTHIA8, PYTHIA8+POWHEG. What was driving these choices? Some information can be found in the paper, but there is not much about it in the thesis.

Irrespective of these questions and comments, I would like to stress that the presented work is of a high quality. It clearly enriches the knowledge in the field of heavy-ion physics and it contributes to our understanding of so called cold-nuclear matter effects. As already said, the thesis documents also technical work on quality control software needed for successful data-taking of the ALICE experiment which is also highly valuable. For all those reasons I can certainly recommend this thesis as a valid dissertation thesis.



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