

I. IDENTIFICATION DATA

Title:	Electromagnetic processes at STAR experiment with regard of colliding beam dynamics
Author's name:	Dominik Šmíd
Type of assignment:	Bachelor thesis
Faculty:	Faculty of Nuclear Sciences and Physical Engineering (FNSPE)
Department:	Department of Physics (DP)
Reviewer:	Guillermo Contreras
Reviewer's affiliation:	KF/FJFI/ČVUT

II. ASSESSMENT OF CRITERIA

Work assignment	Average
<i>Assess how demanding the work topic is.</i>	
[Note: in this context I take average = standard] The student had to learn the basic ideas of a new physics topic (UPCs) not directly covered in his lectures, learn some tools to analyse data from the STAR detector (pyROOT), reproduce the first stages of an analysis using a specific data set (J/ψ diffractive exclusive photoproduction) and then extend the analysis to understand the distribution of interaction vertices along the beamline, comparing the results to a simulation.	
Fulfilling the assignment	Fulfilled
<i>Consider whether the work submitted meets the assignment. If necessary, give your comments on items of the assignment not fully answered, or judge whether the scope of the assignment has been broadened. If student failed to fully treat the assignment, try to assess the importance, impact and/or the reasons for the failings.</i>	
The work is fulfilled. Chapter 1 introduces UPCs, and Chapter 3 presents the analysis of data and the results of the simulation.	
Chosen approach to solution	Appropriate
<i>Assess whether student applied a correct approach or method of solution.</i>	
The tools used are appropriate. The analysis procedure is the standard one in the field.	
Professional standard	Average
<i>Assess the professional standard of the work, application of course knowledge, references, and data from practice.</i>	
[Note: in this context, I take average = good] The topic is of interest in the field. The analysis has been carried out with a good standard. The selection of data and the steps of the analysis are well documented. The figures are clear. I would have liked a bit of discussion on the results of the analysis and of the simulation.	

Level of formality and of the language used

Average

Assess the use of scientific formalism, the typography and language of the work.

[Note: in this context, I take average = good] The structure of the work is clear and the chapters and sections follow logically so the text reads nicely. The work is prepared with standard editorial tools (I guess latex) and conforms with the expectations. Some of the figures in Chapter 1 (and some in Chapter 2) were of bad quality. I guess they are bitmaps. As a suggestion, the student should, for future work, try to obtain the original figures in eps format (available for most of the papers in arXiv) instead of using some screen-shot bitmap. The level of English was good. The major issue were the use of articles (this is common for Czech speakers). These last comments are with the intention of providing feed-back to the student for future work, not to criticise this thesis, which as I stated above I find good.

Choice of references, citation correctness

Average

Assess student's effort in finding and using study sources for completing their work. Give characteristics of the references chosen. Assess whether student made use of all the relevant sources. Verify whether all items used are properly distinguished from the results obtained by student and their deliberations, whether there are no violations of citation ethics, and whether the bibliography presented is complete and complies with the citation usage and standards.

[Note: in this context I take average = standard] The student cites appropriate references in the different stages of the work. When he bases a given section in a given reference he clearly states it so. As far as I am aware, the student does not violate citation ethics. Some of the references were not rendered correctly, the corresponding bibtex entries and bibliography style (or whatever equivalent was used) should have been fine-tuned. See for example [30-32, 43], or [29] that looks incomplete ... or in [35] the name STAR is not written in capitals. Another comment is that frequently the citation is after the full stop at the end of the sentence and not before it. These last comments are with the intention of providing feed-back to the student for future work, not to criticise this thesis, which as I stated above I find good.

Further comments and assessment

Give your opinion on the quality of the main results obtained in the work, e.g. the theoretical results, or the applicability of the engineering or programming solutions obtained, publication outputs, experimental skills, and the like.

The student fulfilled the requested work. The figures in Sec. 3.2.3 present the main kinematic variables after the selection. For future work the student may work a bit on the cosmetic side of the figures, for example taking out the stats box when not needed. I was also surprised that the plots are not labelled with 'This work' or 'This thesis' as it is required for example in ALICE when showing ALICE data. In this case the figures show STAR data, but this is not mentioned in the figures not in the captions. In Sec. 3.2.4 the student presents the main result of the analysis of data. In this section the editorial aspect of the figures is of a lot higher quality. The results themselves look solid and are very interesting. Section 3.2.5 present the results of the simulation which again look very interesting. I only missed a bit of discussion on the results and may be to link them to the text in Sec. 2.2.1 on the RF system of RHIC. Overall, I find the results very good.

III. OVERALL ASSESSMENT, QUESTIONS TO BE ASKED DURING THE WORK DEFENCE, SUGGESTED GRADE

Summarize those aspects of the work that were significantly influential for your overall assessment. Suggest questions to be answered by student during the defence of the work before the examination board.

In the text there are a few wrong statements (if the student is interested I can discuss them with him). This is to be expected when someone starts a new subject, but I guess that a more careful final reading may have averted some of them. As I mentioned above, some of the figures are not of the best quality. Again, this is not a major problem and it is mentioned only as feed-back for future work. I like the chapter with the main results of the thesis. In particular, Section 3.2.4.

Questions

1. Given that ZDC is important for the main results, I would like to ask the student to prepare a bit more information on this detector: what is the time resolution? what is the energy resolution? Can the student provide a 2D plot of the energy deposition in the 2 ZDC detectors?
2. Given the importance of the RF system for the main results, could the student provide a bit more information? What is the frequency at top energy for Au beams? How many bunch slots are in one orbit? What are the standard dimensions of the bunches and how many Au ions are in a bunch? Are the bunches injected in trains or are they isolated bunches?
3. In fig. 3.16 the main bunch is not at zero, but at 26 cm. Could you comment?
4. What are the units in the y-axis of Fig. 3.17?

Suggested grade: **B, very good.**

Date: January 16, 2024

Signature:

