Date	09.03.2017	Overall rating	5
Panel	LT16 Physics Panel 3		
Experts	Hands, Hebecker, Jonson, Leupold, Lipniacka, Mazumdar , Wheldon		
Support reviews			
Application No.	310760		
Call	Academy Project Funding 01.09.2016 - 28.09.2016		
Applicant	jan rak		
Research topic	Probing Soft-Hard Interactions in Relativistic Heavy Ion Collisions with ALICE Experiment at CERN LHC		

1 Quality of research plan	

1.1 Scientific quality and innovativeness of research plan — 5

Guiding questions: How significant is the project scientifically? How high is the potential for breakthroughs or exceptionally significant outcomes? To what extent are the objectives ambitious and beyond the state of the art (e.g. novel concepts and approaches or development across disciplines)?

The proposal aims to study hard-soft interactions to extract, for example, the speed of sound fluidity, viscosity etc. Advances are needed to do this and the proposal aims to refine current flow measurements via new event selection procedures to isolate those containing a di-jet or single hard jet. For this, high statistics Pb-Pb data are needed. Flow in relativistic heavy-ion collisions is a current growth area with techniques enabling evermore precision. The pace of current development is very fast. The proposed analysis techniques represent the state-of-the-art and the potential results would lead to a more complete picture of deconfined state of matter, in particular, its transport properties. The proposal is excellent and absolutely timely, and the obtained data would be extremely welcomed by the heavy-ion community that is driven by a strong interplay between theoretical modeling and experimental results. The proposed work is not, however, completely novel since there are several goups working on this.

1.2 Feasibility of research plan — 5

Guiding questions: Are the objectives and hypotheses appropriately presented and how feasible the research plan is (bearing in mind the extent that the proposed research may include high risks)? Are the research methods and materials appropriate? How well the applicant acknowledges potential scientific or methodological problem areas, and how are alternative approaches being considered? Is the management of the proposed plan appropriate and well planned? Does the research environment support this project, including appropriate research infrastructures?

Overall, the research plan presented is concise and reasonable. Motivation and tasks are well formulated and the whole project program appears feasible, not the least because of the experience of the group on ALICE analysis. The risks are clearly pointed out – namely that strong signals may not be found for the hard-soft interactions – but the planning of activities and the collaboration structures around analysis etc. will maximize the chances of obtaining the desired results. In particular, there is significant quality assurance within the ALICE collaboration at all stages of data handling from calibration to final analysis. Besides the data analysis, the group is also responsible for some hardware of ALICE. A smaller part of the working time of the PhD student and of the postdoc will be dedicated to the hardware tasks and to beam time shifts. The personnel will share its time between Jyväskylä and CERN. Additionally, there are strong links to theoreticians in heavy-ion physics (e.g. shared seminars) at JYFL. This is vital in tuning the analysis and interpreting the results.

1.3 Ethical aspects and open science

Guiding questions: Are there any ethical issues involved and, if so, how are they taken into account? What is the intended level of open access to research results? Is the data management plan worked out in a sufficient way?

No ethical issues are involved. The data management plan and the open access plan are appropriate.

2 Competence of applicant(s), quality of research collaborations	
2.1 Competence and expertise of applicant(s) *Guiding questions*: What are the merits and scientific expertise of the applicant(s)? Are they appropriate and sufficient for the proposed project? What are the competences of the applicant(s) in terms of supervising PhD candidates / postdoctoral researchers?	6

The PI has a lot of relevant experience in heavy-ion measurements and strong publication record including books on the field. He appears to be the perfect scientist to address complex observables that require a deep understanding of the intricate data produced in heavy-ion reactions. Due to his experience in supervising Master and PhD students, he is also very well prepared to lead the personnel that is proposed to be hired for this project.

2.2 Research team, significance of research collaborations

Guiding questions: Does the research team bring complementary expertise to the project (if applicable)? How does the national and/or international research collaboration contribute to the success of the project? Does the research project support researcher training?

According to the proposal the collaborators are the local colleagues who form Jyväskylä's ALICE analysis group together with the applicant. On the other hand, due to the frequent meetings of the ALICE collaboration one might regard more or less all ALICE members as discussion/collaboration partners for this project in a more extended sense. The research training opportunities at CERN and JYFL are extremely good. In addition to PI, support from two other senior members of the group is outlined – an expert in flow analysis and a staff member able to teach the necessary skills and to support junior staff.

2.3 Researcher mobility

Guiding questions: How does the mobility plan support the research plan?
Does the receiving organisation stand out in the respective field of research?
Is the length of the mobility period appropriate and is its timing right for the project?

Mobility concerns solely the extended stays at CERN that are required by the hardware and beam time related tasks. Since there are no external collaborators the mobility plan is essentially predefined by the task requirements. Clearly the PhD student and the postdoc will profit on the one hand from the strong heavy-ion group - theory and experiment - of Jyväskylä University and on the other hand from the outstanding international environment of CERN.

2.4 Research consortium (if applicable)

Guiding question: If a consortium is involved, what is the significance and added value of the consortium for the attainment of the research objectives?

Not applicable.

3 Overall assessment

3.1 Main strengths and weaknesses of the project, additional comments and suggestions.

Please note that the final rating should not be a mathematical average of the sub-ratings.

Overall, the research plan is well written, the PI has put significant effort to outline both the physics analysis and the procedures involved in terms of quality assurance and data handling. The goals are clearly defined and timely. As part of the ALICE collaboration, a large research output is guaranteed, and the postdoc and PhD student to be hired will find a good starting point for their scientific careers. The project will continue and extend the international visibility of Finnish heavy-ion research. The proposed project is excellet and there are no major weaknesses. However, as stated in 1.1., many groups are are working on this topic and the proposed work is in that sense not completely novel.