Referee report for the extraordinary session of the PAC for Condensed Matter Physics for the assessment of related JINR projects

Project: "Novel semiconductor detectors for fundamental and applied research".
Theme 1126, Project Leader G.A. Shelkov for the period 2015-2023

Introduction:

This project concerns itself with novel semiconductor detectors. This is both as a member of the Medipix4 collaboration, and the use of these pixelated detectors, and as a member of the FCAL collaboration and the development of suitable GaAs material. This is an interdisciplinary project, mostly targeting fundamental physics, though topics of relevance here are for applications in microtomography, biology and radiomedicine.

Novelty, scientific impact and timeliness:

These detectors have capabilities at the edge of state-of-the-art. Therefore they are novel and their scientific impact is in terms of opening up new fields of study. This can be seen from the publication list in the questionnaire and the fact that the project attracts junior researchers, including PhD students. This is important for the institute.

These devices are in general revolutionary when they can be applied to new fields of study, and open up novel science in doing so.

However, the level of detail in the questionnaire - on both the applications and in the project plan - makes it difficult to judge the impact of this project on the topics of relevance to the CMP PAC. It should be possible to show that these devices have a very high impact towards radiobiology.

GaAs is a wonderful new material - however it has low relevance to the CMP PAC.

Having said this, the reviewer would also like to acknowledge that this is possibly treating a very much interdisciplinary project unfairly, as it is by its very nature broad in its approach. This project also very much depends upon the vast breadth of both facilities and expertise at JINR for its execution.

Expertise of team:

The team is appropriate to the project. It is large and has a broad range of skills. The weak point lies in the fact that many members are at 0.1 or 0.2 FTE, a level at which it might sometimes be difficult to contribute effectively. However the team as a whole has the skills to execute the project.

It is also a strong point of the project in that it encompasses a wide range of junior researchers, and is attractive for that. This is important to ensure that future talent is nurtured and mentored within JINR.

Proposed project plan:

The project plan as presented in the questionnaires realistic. However, it is quite lacking in detail in general.

From the reviewers experience, the requested budget is appropriate for the project.

Summary:

There is no doubt that this project will make excellent and novel technological progress. It will produce significant technological gains, and that technology will enable excellence science.

Where the reviewer is in doubt is that the links to the CMP PAC are tenuous - it is mainly targeted at fundamental physics. The radiobiology and medicine aspects seem tagged on currently in the project as presented in the questionnaire. Additionally the level of details on the project and what it is aiming to achieve (in particular in the relevant areas to this PAC) is limited.

It should be noted that there are many potential applications in the field of this PAC, where this technology could have impact.

Therefore, I recommend ranking this in the category B: a very good project, but with some weaknesses. They should be funded together with a strong recommendation on where improvement is needed.

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