Reviewer Report

Project: Development of an inelastic neutron scattering spectrometer in inverse geometry at the IBR2 reactor.
Theme: Studies of functional materials and nanosystems using neutron scattering (04-4-xxxx-2021/2025).
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Thank you for sharing with me *Appendix 1* (Form No. 24) of the abovementioned project, entitled *Development of an inelastic neutron scattering spectrometer in inverse geometry at the IBR 2 reactor.* From my own personal perspective, I am enclosing below a few remarks on the contents of this document, as well as on the broader rationale and context behind this exciting project.

Historically, FLNP can pride itself on being one of the research institutions that pioneered the use of pulsed neutron-scattering techniques, when these sources were still in their infancy. Decades on, the field of inelastic scattering using pulsed neutrons has evolved well beyond recognition relative to those early days, and this project proposal recognizes the need for FLNP to 'catch-up' with these developments in a substantive and sustainable manner. For well over a decade, I have been personally involved in the latest developments on TOSCA at the Rutherford Appleton Laboratory in the United Kingdom [1,2], as well as on the conceptualization and subsequent design of VESPA at the European Spallation Source in Sweden [3,4]. In both cases, these scientific initiatives have been heavily underpinned by a growing and increasingly strong community of non-traditional users of neutron spectroscopy, including the industrial sector – see, e.g., Ref. [5]. This proposal does well at recognizing these emerging and yet-to-be-tapped opportunities for the ultimate benefit of the FLNP user community.

In terms of instrumentation, the choice of a broadband (inverted-geometry) neutron spectrometer is both wise and timely, given its technical characteristics and expected performance, ease of operation and use, as well as the natural and direct link to other techniques like Raman or IR spectroscopies across chemistry, biology, engineering or materials science – see, e.g., Fig. 2 of the project documentation. While illustrative, the few examples given in the project proposal can only offer a glimpse of the true depth and breadth of scientific and technological areas that could be of relevance to the use of this new instrument at FLNP, well beyond research themes traditionally linked to the use of neutron spectroscopy as a condensed matter probe. As such, I would encourage the project team to establish robust and durable links between the proposed technical developments and parallel efforts to nurture and grow the current user base and associated stakeholders in the areas of both experimental and computational neutron science, in much the same way other neutron sources around the world have and continue to do so to this day – notable examples include the research programmes on LAGRANGE at the ILL (France), TOSCA at RAL (United Kingdom), or VISION at ORNL (U.S.A.). The list of research institutions supporting this initiative and listed in Section 1.4 of the project document is certainly a good starting point, in a geographical region where these new capabilities could certainly give rise to new and exciting science, as well as to a more vibrant global community.

On technical grounds, this new spectrometer also shares a number of important features with VESPA, particularly in terms of the need for a chopper cascade to suppress backgrounds and tailor spectral resolution. In this context, the project team is strongly encouraged to learn from past (yet relatively recent) lessons, as detailed in, e.g., Refs. [2-4] and references therein. Similar considerations apply to ongoing efforts to push the boundaries of existing instrumentation beyond what is currently possible, particularly concerning its use in truly parametric studies or under extreme conditions, both emerging areas of research for the discipline [6].

Let me conclude by reiterating my wholehearted support for a project of this nature at FLNP. Given the current landscape of neutron sources and instrumentation worldwide, it is a timely venture well-worth pursuing. I very much hope that it is supported.

References

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[4] K.H. Andersen *et al., Nucl. Instrum. Methods Phys. Res. A* **957** (2020) 163402. URL: 10.1016/j.nima.2020.163402
[5] F. Fernandez-Alonso and D. L. Price eds., *Neutron Scattering – Applications in Biology, Chemistry, and Materials Science* (Academic Press, Cambridge, 2017). URL: 10.1016/B978-0-12-805324-9.09990-8
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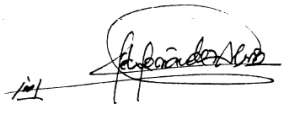

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