Referee Report for the HyperNIS–SRC Project Proposal

The HyperNIS–SRC project, hosted at the VBLHEP laboratory, is a research initiative focusing on particle physics and relativistic nuclear physics. Led by D. O. Krivenkov and J. Lukstins, with M. A. Patsyuk as the deputy leader, the project is structured into two main components: the HyperNIS program, focusing on hypernuclear research, and the SRC program, investigating Short-Range Correlations in nuclear matter. The initiative, spearheaded by a collaboration of researchers from multiple institutions, aims to explore the properties and interactions of neutron-rich hypernuclei and delve into the dynamics of inelastic reactions near kinematical borders.

Innovation and Scientific Merit:

- The HyperNIS segment is dedicated to investigating the role of strangeness in nuclei, particularly focusing on open strangeness in hypernuclei. The project's to the study of light, neutron-rich hypernuclei, with particular emphasis on confirming the existence of $6\Lambda H$ and examining the lifetimes and production cross-sections of $4\Lambda H$ and $3\Lambda H$. The program also intends to extend its research scope to include $6\Lambda He$ and to ascertain the binding energy of the $3\Lambda H$ hypernucleus. The proposed methodologies, including the deployment of the HyperNIS spectrometer and techniques for estimating the binding energy of the $3\Lambda H$ hypernucleus, are methodically planned and hold promise for advancing our understanding in this area.
- The SRC component aims to conduct a detailed investigation of Short-Range Correlations at the Joint Institute for Nuclear Research (JINR) over an outlined two-phase period. The project's methodology is comprehensive, employing a combination of advanced detection equipment and techniques.

Technical Approach and Feasibility:

- The project's methodology is comprehensive, focusing on the production and decay of high-energy hypernuclei. This strategy facilitates accurate measurements and in-depth analysis of hypernuclei properties. The detailed layout of the HyperNIS+SRC spectrometer, including its components and detectors, illustrates a well-considered plan for execution.
- Recent progress, such as the implementation of the 7Li beam to the spectrometer and upgrades in software and background suppression, demonstrate the project's technical capabilities and readiness to proceed with the proposed research activities.

Potential Impact:

- The HyperNIS–SRC project is expected to contribute significantly to our knowledge of hypernuclei and short-range correlations. Its outcomes could enhance theoretical models and provide insights into related fields, such as astrophysics and the study of neutron stars.

- The project's rigorous experimental approach and commitment to solving fundamental questions in particle and nuclear physics are likely to inspire further research and collaborations, benefiting the scientific community at large.

In summary, the HyperNIS–SRC project presents a focused and well-structured approach to exploring key aspects of nuclear physics, specifically in the realms of hypernuclear research and the study of inelastic reactions. The dual focus on HyperNIS and SRC studies enables a broad yet detailed examination of the intricacies involved in nuclear matter interactions and hypernuclei properties. The project's leadership and team demonstrate a clear understanding of the scientific objectives and possess the technical expertise to execute the planned experiments. The project funding is reasonable. Thus, I recommend this project for funding, recognizing its potential to yield valuable contributions to the field and to advance our understanding of the underlying principles governing hadronic matter.

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