Referee report on the project
“Construction of the SPD detector at NICA”

Over the last 3 decades, both polarized deep inelastic scattering experiments (CERN, DESY, JLab, SLAC) and high-energy polarized proton-proton collisions (RHIC at BNL) have provided lot of information about spin-dependent structure of the nucleon. Nevertheless, the internal structure of the nucleon is still not fully understood, especially about its gluon content.

The Spin Physics Detector (SPD) is planned as an universal setup to be installed in the second interaction point of the NICA collider to study the spin structure of the proton and deuteron and other spin-related phenomena using a unique possibility to operate with polarized proton and deuteron beams at a collision energy up to 27 GeV and a luminosity up to 10^{32} cm^{-2} s^{-1}. As the main goal, the experiment aims to provide access to the gluon TMD PDFs in the proton and deuteron, as well as the gluon transversity distribution and tensor PDFs in the deuteron, via the measurement of specific single and double spin asymmetries using different complementary probes such as charmonia, open charm, and prompt photon production processes. Other polarized and unpolarized physics is possible, especially at the first stage of NICA operation with reduced luminosity and collision energy of the proton and ion beams. It is important to emphasize the possibility to perform a scan on the energy, passing from the region of non-perturbative QCD to the region of applicability of the factorization theorem. The experimental setup was designed (see **arXiv:2404.08317v1 [hep-ex] 12 Apr 2024**) as a universal almost 4π detector with advanced tracking and particle identification capabilities based on modern technologies.

The SPD project has a physics program deeply developed and supported by the international scientific community. The SPD Conceptual Design Report has successfully passed an external international expert review. The SPD team presented an elaborate Technical Project of the setup with the cost estimate. They have formed a strong scientific collaboration around this project, with a significant part of its members having a background in spin physics. The team has sufficient groundwork to begin the construction of the first phase of the detector. The requested resources seem proportional to the complexity of the project.

Based on the above, I fully support the implementation of the initial part of the SPD project in 2025-2029.

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