Annex 3.

Form of opening (renewal) for Project /
Sub-project of LRIP

APPROVED

JINR DIRECTOR

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"_____"202г.

PROJECT PROPOSAL FORM

Opening/renewal of a research project/subproject of the large research infrastructure project within the Topical plan of JINR

1. General information on the research project of the theme/subproject of the large research infrastructure project (hereinafter LRIP subproject)

1.1 Theme code / LRIP (for extended projects)

02-1-1065-2007/20XX

1.2 Project/LRIP subproject code (for extended projects)

02-1-1065-4-2020/20XX

1.3 Laboratory

VBLHEP

1.4 Scientific field

High-energy physics

1.5 Title of the project/LRIP subproject

Constructionof the SPD facility for studying spin effects in nuclear interactions

1.6 Project/LRIP subproject leader(s)

A. Guskov

1.7 Project/LRIP subproject deputy leader(s) (scientific supervisor(s))

V. Ladygin

2 Scientific case and project organization

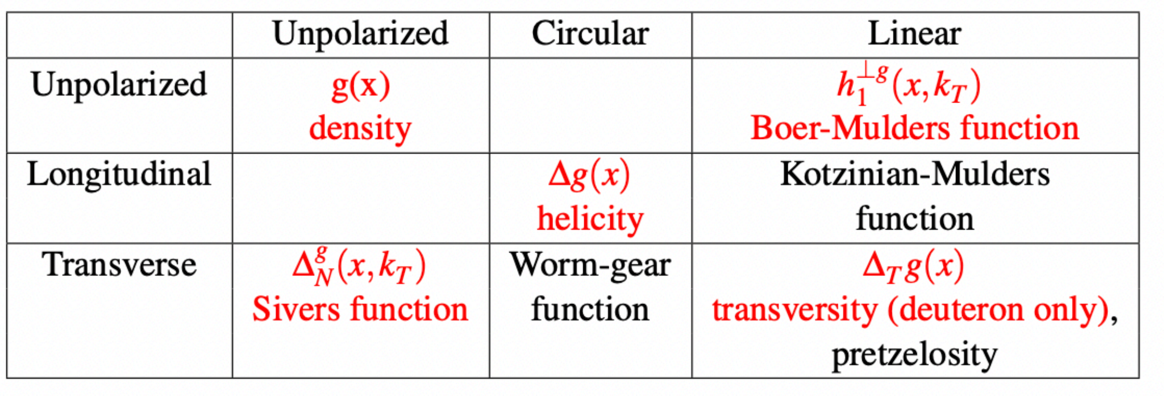
2.1 Annotation

Spin Physics Detector is a planned experimental facility at the NICA collider designed to study proton and deuteron spin structure and other spin-dependent phenomena using polarized proton and deuteron beams at collision energies up to 27 GeV and luminosities up to 10^{32} cm^{-2} s^{-1}. In polarized proton-proton collisions, the SPD experiment will close the gap in the kinematic domain between low-energy measurements at ANKE-COSY and SATURNE and high-energy measurements at the Relativistic Heavy Ion Collider (RHIC), as well as the planned fixed-target experiments at the LHC. As for the possibility of NICA working with polarized deuteron beams at these energies, it is unique. The SPD is planned to operate as a universal facility to comprehensive study the unpolarized and polarized gluon structure of the nucleon at large and medium values of the x variable using different complementary probes such as: charmoniums, open charm and direct photon production. The measurement of parton distributions that depend on the transverse momentum of partons in the nucleon (TMD PDFs) is a priority. The study of spin effects in the elastic scattering of protons and deuterons and in the production of lambda-hyperons, the search for dibaryon resonances, the study of the production of charmed particles at the threshold, the study of multiquark correlations, and other polarized and unpolarized physics will be available at the first stage of the collider's operation with reduced luminosity and collision energy of proton and ion beams. The proposed physics program covers at least 5 years of SPD operation.

2.2 Scientific case (aim, relevance and scientific novelty, methods and approaches, techniques, expected results, risks)

Quantum chromodynamics has a remarkable success in describing the high-energy and large-momentum transfer processes, where partons in hadrons behave, to some extent, as free particles and, therefore, the perturbative QCD approach can be used. Cross-section of a process in QCD is factorized into two parts: the process-dependent perturbatively-calculable short-distance partonic cross-section (the hard part) and universal long-distance functions, PDFs and FFs (the soft part). Nevertheless, a largest fraction of hadronic interactions involves low-momentum transfer processes in which the effective strong coupling constant is large and the description within a perturbative approach is not adequate. A number of (semi-)phenomenological approaches have been developed through the years to describe strong interaction in the non-perturbative domain starting from the very basic principles. They successfully describe such crucial phenomena, as the nuclear properties and interactions, hadronic spectra, deconfinement, various polarized and unpolarized effects in hadronic interaction, etc. The transition between the perturbative and non-perturbative QCD is also a subject of special attention. In spite of a large set of experimental data and huge experience in few-GeV region with fixed-target experiments worldwide, this energy range still attracts both experimentalists and theoreticians.

Gluons, together with quarks, are the fundamental constituents of the nucleon. They play a key role in generation of its mass and carry about half of its momentum in hard (semi)inclusive processes. The spin of the nucleon is also built up from the intrinsic spin of the valence and sea quarks (spin-1/2), gluons (spin-1), and their orbital angular momenta. Notwithstanding the progress achieved during the last decades in the understanding of the quark contribution to the nucleon spin, the gluon sector is much less developed. One of the difficulties is the lack of the direct probes to access gluon content in high- energy processes. While the quark contribution to the nucleon spin was determined quite precisely in semi-inclusive deep-inelastic scattering (SIDIS) experiments like EMC, HERMES, and COMPASS, the gluon contribution is still not well-constrained even so it is expected to be significant.

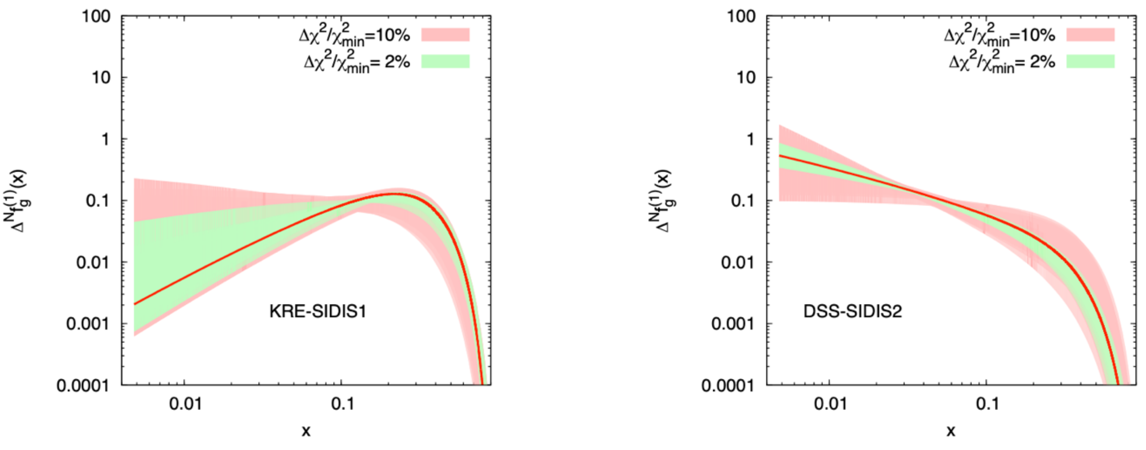


	Unpolarized	Circular	Linear
Unpolarized	g(x) density		$h_1^{\perp g}(x, k_T)$ Boer-Mulders function
Longitudinal		$\Delta g(x)$ helicity	Kotzinian-Mulders function
Transverse	$\Delta_N^g(x, k_T)$ Sivers function	Worm-gear function	$\Delta_T g(x)$ transversity (deuteron only), pretzelosity

Tab 1 Leading order TMD PDFs.

In recent years, the three-dimensional partonic structure of the nucleon became a subject of a careful study. Precise mapping of three-dimensional structure of the nucleon is crucial for our understanding of Quantum Chromodynamics (QCD). One of the ways to go beyond the usual collinear approximation is to describe nucleon content in the momentum space employing the so-called Transverse-Momentum-Dependent Parton Distribution Functions (TMD PDFs) [1–6] (see Tab. 1).

The most powerful tools to study TMD PDFs are the measurements of the nucleon spin (in)dependent azimuthal asymmetries in SIDIS [1, 4, 5, 7] and Drell–Yan processes [8, 9]. Complementary information on TMD fragmentation process, necessary for the interpretation of SIDIS data, is obtained from e^+e^- measurements [10]. Being an actively developing field, TMD physics triggers a lot of experimental and theoretical interest all over the world, stimulating new measurements and developments in TMD extraction techniques oriented on existing and future data from lepton-nucleon, electron-positron and hadron-hadron facilities at BNL, CERN, DESY, FNAL, JLab, and KEK. For recent reviews on experimental and theoretical advances on TMDs see Refs. [11–15]. While a lot of experimental measurements were performed (and are planned) and theoretical understanding was achieved for Leading Order (LO) (twist-2) TMD PDFs such as Sivers, transversity and Boer-Mulders functions of quarks, only few data relevant for the study of gluon TMD PDFs are available [16–21]. Example of the global fit results for the gluon Sivers function is presented in Fig. 1.



(a) (b)

Fig. 1 The first k_T-moment of the gluon Sivers function for two different extractions of the quark Sivers functions.

The simplest model of the deuteron is a weakly-bound state of a proton and a neutron mainly in the S-wave with a small admixture of the D-wave state. This approach is not much helpful in the description of the deuteron structure at large Q^2. It failed to describe the HERMES experimental results on the b_1 structure function. A unique possibility to operate with polarized deuteron beams brings us to the world of the tensor structure of the deuteron. A possible non-baryonic content in the deuteron could play an important role in the understanding of the nuclear modification of PDFs (the EMC effect). Since the gluon transversity operator requires two-unit helicity-flip it does not exist for spin-1/2 nucleons [22]. Therefore, proton and neutron gluon transversity functions can not contribute directly to the gluon transversity of the deuteron. A non-zero deuteron transversity could be an indication of a non-nucleonic component or some other exotic hadronic mechanisms within the deuteron.

Most of the existing experimental results on spin-dependent gluon distributions in nucleon are obtained in the experiments at DESY (HERMES), CERN (COMPASS), and BNL (STAR and PHENIX). Study of polarized gluon content of the proton and nuclei is an important part of future projects in Europe and the United States such as AFTER@LHC and LHCSpin at CERN, and EIC at BNL [23–25]. Notwithstanding, the gluons in nucleon were successfully probed in SIDIS measurements, hadronic collisions have an important advantage since they probe the gluons at the Born-level without involving the EM couplings. The energy range covered by the SPD experiment in polarized p-p collisions with respect to the other present and future spin projects is shown in Fig 2.

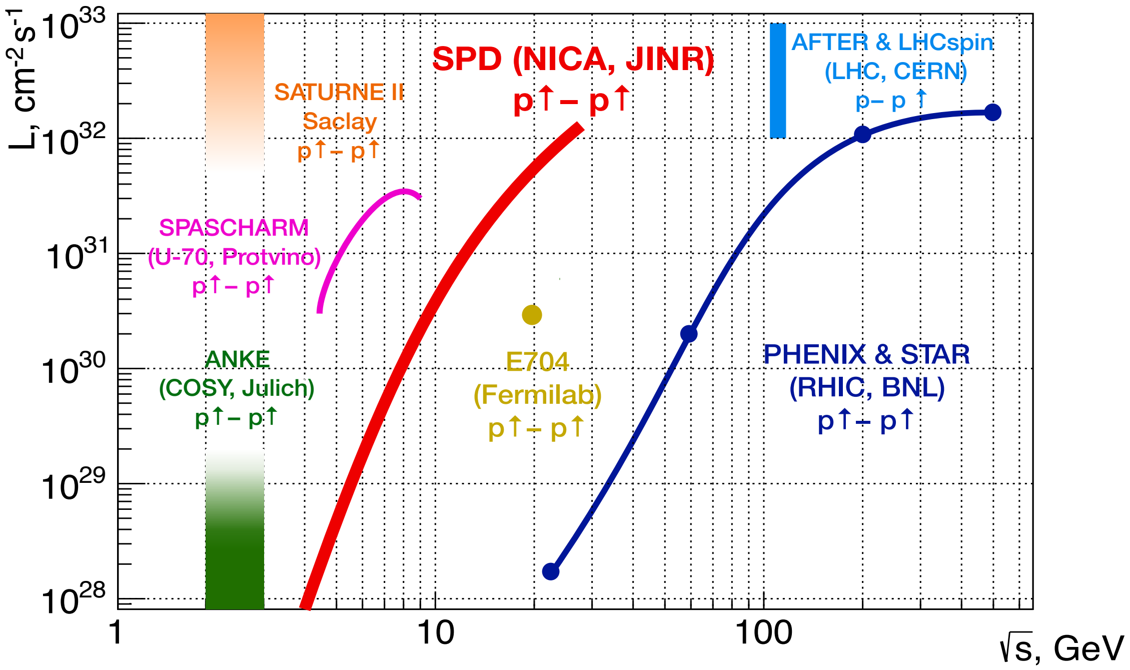


Fig 2. NICA SPD and the other past, present, and future experiments with polarized protons.

The detailed description of the physics tasks that will be addressed at SPD could be found at [26-28].

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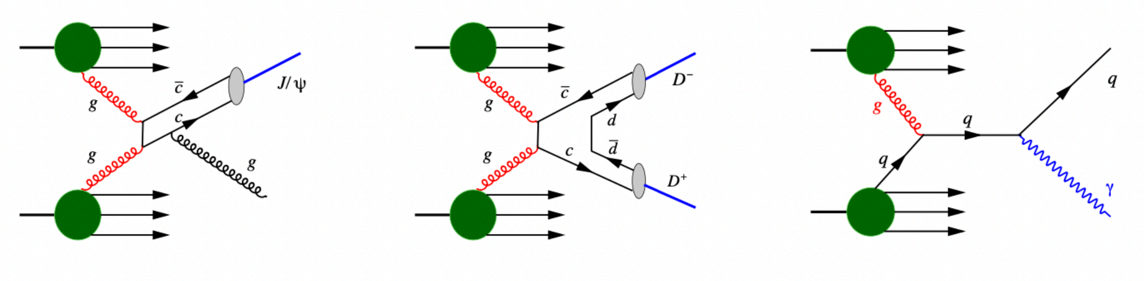
Proposed measurements

The polarized gluon content of proton and deuteron at intermediate and high values of the *x-variable* is proposed to be investigated at SPD using three complementary dedicated probes: inclusive production of charmonia, open charm (both via gluon-gluon fusion gg→ccbar), and prompt photons qg→qγ (see Fig. 3). Study of these processes is complementary to such proven approaches to access the partonic structure of the nucleon in hadronic collisions as the inclusive production of hadrons with high transverse momentum and the Drell-Yan process. Unfortunately, the latter one is unlikely to be accessible at SPD due to the small cross-section and unfavourable background conditions. For effective registration of each aforementioned gluon probes, the SPD setup is planned to be equipped with a range (muon) system, an electromagnetic calorimeter, a time-of-flight system, straw tracker, and a silicon vertex detector. Nearly a 4π coverage of the setup and a low material budget in the inner part of the setup should provide a large acceptance for the detection of the desired final states.



(a) (b) (c)

Fig. 3 Diagrams illustrating three probes to access the gluon content of proton and deuteron in po- larized collisions at NICA SPD: production of (a) charmonium, (b) open charm, and (c) prompt photons.

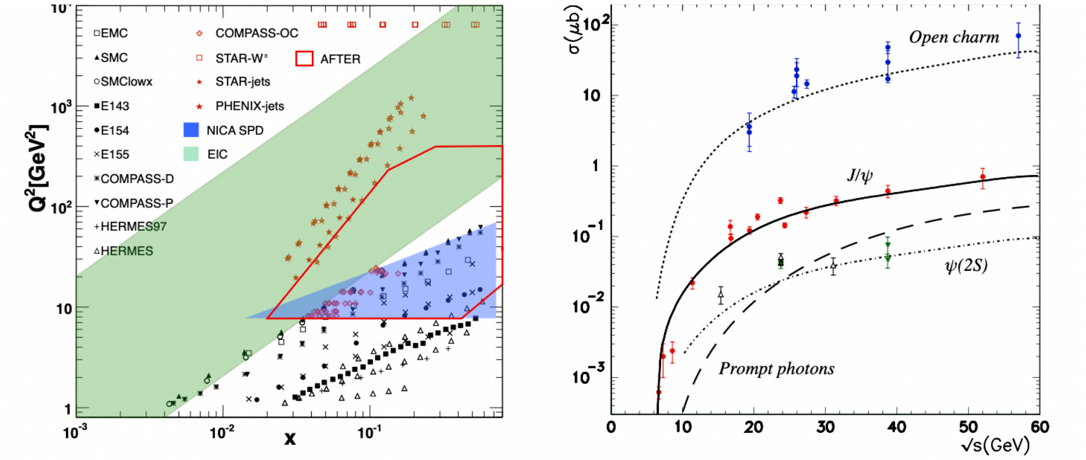


Fig. 4: (a) The kinematic coverage, in the (x, Q^2) plane, of the hadronic cross-section data for the processes commonly included in global QCD analyses of polarized quark (black) and gluon (red) PDFs. The kinematic domain expected to be covered by NICA SPD by charmonia, open charm and prompt-photon production is shown in blue. (b) The cross-section for the processes of open charm, *J*/ψ, ψ(2*S*) and prompt photons (p_T > 3 GeV) production as a function of center-of-mass energy.

Such gluon probe as inclusive production of neutral and charged pions and other light mesons, for which the $qg \rightarrow qg$ hard process dominates in a certain kinematic region and which have been successfully used to access the polarized gluon content of the proton at the RHIC experiments, can of course be used at SPD for this purpose. Registration of these processes does not impose additional specific requirements on the experimental setup and can be performed in parallel with the aforementioned main probes.

The experiment aims at providing access to the gluon helicity, gluon Sivers, Boer-Mulders functions, and other TMD PDFs in the proton and deuteron via the measurement of specific single and double spin asymmetries. Tensor asymmetries measured in polarized d-d collisions will be used to access the tensor PDFs for quarks and gluons. At the first stage of SPD operation in a basic configuration with a reduced beam energy and luminosity the attention will be paid to study of polarized and unpolarized phenomena in the nonperturbative region such as spin effects in p-p and d-d scattering, multiquark states and correlations, polarization of hyperons, hypernuclei, short-range correlations in collisions of light ions (up to Ca) etc.

A tentative running plan of the SPD experiment is presented in Tab. 2.

Physics goal	Required time	Experimental conditions
First stage		
Spin effects in *p-p* scattering dibaryon resonanses	0.3 year	$p_{L,T}$-$p_{L,T}$, $\sqrt{s}$ <7.5 GeV
Spin effects in *d-d* scattering hypernuclei	0.3 year	d_{tensor}-d_{tensor}, $\sqrt{s}$ <7.5 GeV
Hyperon polarization, SRC, ... multiquarks	0.3 year	ions up to Ca
Second stage		
Gluon TMDs, SSA for light hadrons	1 year	p_T-p_T, $\sqrt{s}$ =27 GeV
TMD-factorization test, SSA, charm production near threshold, onset of deconfinment, $\bar{p}$ yield	1 year	p_T-p_T, 7 GeV< $\sqrt{s}$ <27 GeV (scan)
Gluon helicity, ...	1 year	p_L-p_L, $\sqrt{s}$ =27 GeV
Gluon transversity, non-nucleonic structure of deuteron, "Tensor porlarized" PDFs	1 year	d_{tensor}-d_{tensor}, $\sqrt{s_{NN}} = 13.5$ GeV or/and d_{tensor}-p_T, $\sqrt{s_{NN}} = 19$ GeV

Tab. 2: Tentative running plan of the SPD experiment.

The physics goals dictate the layout of the detector. The SPD experimental setup (see Fig. 5) is being designed as a universal 4π detector with advanced tracking and particle identification capabilities based on modern technologies. The silicon vertex detector (VD) will provide resolution for the vertex position on the level of below 100 μm needed for reconstruction of secondary vertices of *D*-meson decays. The straw tube-based tracking system (ST) placed within a solenoidal magnetic field of up to 1 T at the detector axis should provide the transverse momentum resolution about 2% for a particle momentum of 1 GeV/*c*. The time-of-flight system (PID) with a time resolution of about 60 ps will provide 3σ π/K and K/p separation of up to about 1.2 GeV/*c* and 2.2 GeV/*c*, respectively. Possible use of the aerogel-based Cherenkov detector (FARICH) could extend this range. Detection of photons will be provided by the sampling electromagnetic calorimeter (ECal) with the energy resolution $\sim 5\%/\sqrt{E}$. To minimize multiple scattering and photon conversion effects for photons, the detector material will be kept to a minimum throughout the internal part of the detector. The muon (range) system (RS) is planned for muon identification. It can also act as a rough hadron calorimeter. The beam-beam counters (BBC) and zero-degree calorimeters placed on both sides of the interaction region will be responsible for the local polarimetry and luminosity control. To minimize possible systematic effects, SPD will be equipped with a triggerless DAQ system. A high collision rate (up to 4 MHz) and a few hundred thousand detector channels pose a significant challenge to the DAQ, online monitoring, offline computing system, and data processing software.

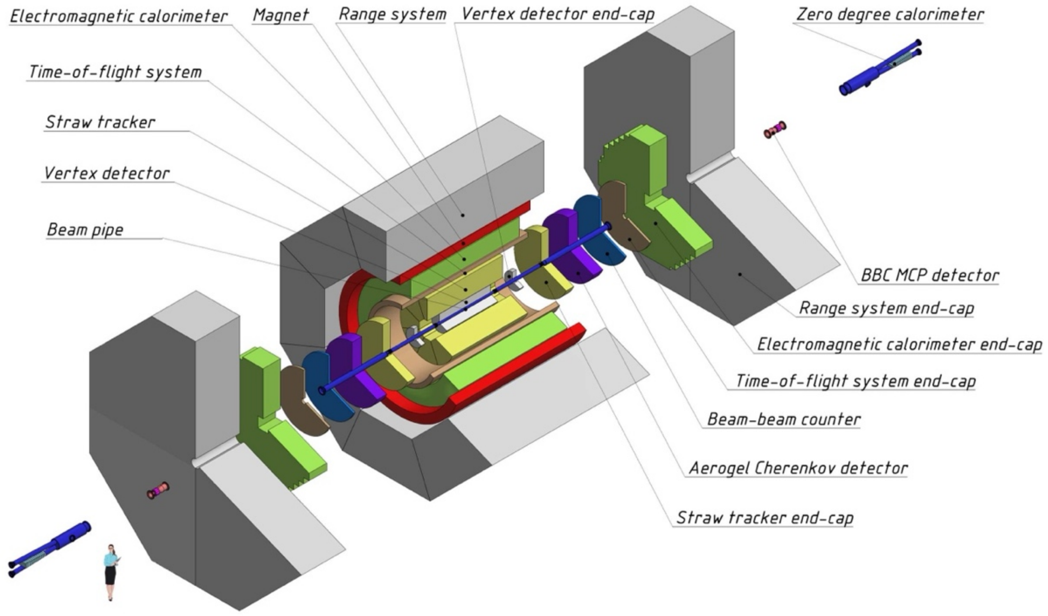


Figure 5 Layout of the SPD experimental setup.

The SPD operation could be started already in 2030 using the possibilities of polarized p-p and d-d collisions at √s<9.4 GeV and <4.5 GeV/nucleon, respectively, as well as A-A collisions. The starting configuration should consist of the range system, solenoidal magnet, straw tube-based tracking system, and the pair of zero-degree calorimeters and beam-beam counters. A simple micromegas-based central tracker will be installed in the central region instead of the sophisticated silicone vertex detector to keep the reasonable momentum resolution. The detailed description of the SPD setup can be found at [1].

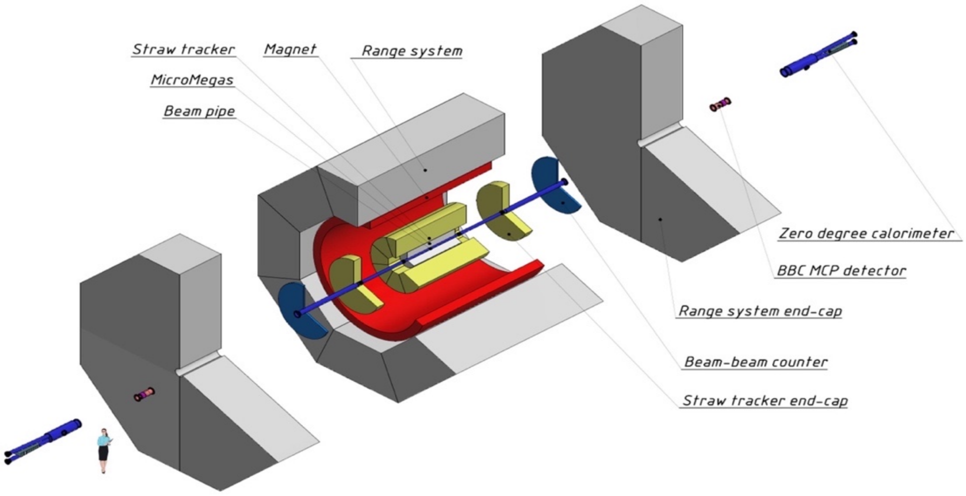


Figure 6. First-stage configuration of the SPD setup.

References

[1] SPD collaboration, Technical Design Report, 2022 -2024

Risks and possible difficulties during the project implementation

1) Significant increase in the project cost due to changes in the geopolitical situation and availability of foreign components, materials and technologies.
2) Delay in the creation and development of the accelerator infrastructure of the NICA complex for work with polarized beams.
3) Uncertainty with the parameters of polarized and unpolarized beams available for the first phase of the experiment.

Work plan for the period 2025-2029.

1) Development of design documentation, construction and testing of prototypes, production of detectors and subsystems of the First Phase of the project: muon system, superconducting solenoid and associated cryogenic system, straw-tube-based track detector, beam-beam collisions counter (BBC), MCP-based beam collision detector, Micromegas-based central tracker, zero-degree calorimeter (ZDC), end-cap part of the electromagnetic calorimeter, data acquisition system, slow control system, gas distribution system, and supporting structures.
2) Preparation, construction, and test the computer infrastructure for Monte Carlo simulations for the benefit of the SPD project, and prepare data acquisition and storage systems.
3) Continuation of R&D for the Phase II detectors: silicon vertex detector, time-of-flight system, electromagnetic calorimeter, and aerogel-based detector.
4) Interaction with the VBLHEP Accelerator Department on the issues of building, testing and optimization of infrastructure for operation with polarized proton and deuteron beams at the NICA collider.

2.3 Estimated completion date

2025 - 2029

2.4 Participating JINR laboratories

VBLHEP, DLNP, MLIT, BLTP

2.4.1 MICC resource requirements

Computing resources	Distribution by year				
	1st year	2nd year	3rd year	4th year	5th year
Data storage (TB) - EOS - Tapes	0 1500	2000 2000	5000 10000	7000 14000	10000 20000
Tier 1 (CPU corehours)	17 520 000	43 800 000	87 600 000	131 140 000	175 200 000
Tier 2 (CPU corehours)	1 752 000	4 380 000	8 760 000	13 114 000	17 520 000
SC Govorun (CPU core hours)	1 752 000	4 380 000	8 760 000	8 760 000	8 760 000

- CPU - GPU	175 200 000	438 000 000	876 000 000	876 000 000	876 000 000
Clouds (CPU cores)	100	150	200	200	250

2.5. Participating countries, scientific and educational organizations

Organization	State	City	Participants	Type of agreement
AANL	Armenia	Yerevan	N. Ivanov +	MoU
PNPI	Russia	Gatchina	V. Kim +	MoU
Samara University	Russia	Samara	V. Saleev +	MoU
SPbPU	Russia	St.-Petersburg	Ya. Berdnikov +	MoU
SPbSU	Russia	St.-Petersburg	V. Vechernin +	MoU
SINP MSU	Russia	Moscow	A. Berezhnoy +	MoU
Tomsk State University	Russia	Tomsk	S. Filimonov+	MoU
Belgorod State University	Russia	Belgorod	A. Kubankon+	MoU
Lebedev Inst.	Russia	Moscow	V. Andreev+	MoU
INR	Russia	Troitsk	E. Usenko +	MoU
MEPhI	Russia	Moscow	G. Nigmatkulov+	MoU
INP (Republic of Kazakhstan)	Kazakhstan	Almaty	S. Sakhiev +	MoU
INP Belorussian State University	Belarus	Minsk	A. Lobko +	MoU
Budker Institute of Nuclear Physics	Russia	Novosibirsk	A. Barnyakov+	MoU
Havana University	Cuba	Havana	F. Guzman+	
Kurchatov Institute	Russia	Moscow	I. Alexeev+	
JHEP	Russia	Protvino	S. Golovnya+	
HSE University	Russia	Moscow	F. Ratnikov+	
iThemba LABS	SA	Cape Town	N. Stodart+	
Institute of Physics (Belgrade Univ.)	Serbia	Belgrade	D. Maletic	
Gomel State University	Belarus	Gomel	V. Andreev+	
Institute of Applied Physics of NAS	Belarus	Minsk	R. Shulyakovsky	
Institute of Physics of NAS	Belarus	Minsk	Yu. Kulchitsky+	
Tsinghua University	China	Beijing	Y. Wang+	
SAPHIRE/Andreas Bello Univ.	Chile	Santiago	S. Kuleshov	

2.6. Key partners *(those collaborators whose financial, infrastructural participation is substantial for the implementation of the research program. An example is JINR's participation in the LHC experiments at CERN).*

3. Manpower

3.1. Manpower needs in the first year of implementation

№№ n/a	Categoryofpersonnel	JINR staff, amount of FTE	JINR Associated Personnel, amount of FTE
1.	researchscientists	60	10
2.	engineers	40	
3.	specialists	1	
4.	officeworkers		
5.	technicians	5	
	Total:	**106**	**10**

3.2. Available manpower
3.2.1. JINR staff

No.	Category of personnel	Full name	Division	Position	Amount of FTE
1.	Research scientists	128			64.0
		V. Abazov	DLNP	researcher	0,9
		L. Afanasyev	DLNP	senior researcher	0,8
		R. Akhunzyanov	VBLHEP	researcher	1
		V. Alexakhin	VBLHEP	leading researcher	0,5
		G. Alexeev	DLNP	head of sector	0,9
		A. Allakhverdieva	DLNP	intern researcher	1
		E. Alexandrov	LIT	researcher	0,3
		I. Alexandrov	LIT	head of sector	0,3
		N. Anfimov	DLNP	head of sector	0,3
		V. Astakhov	VBLHEP	senior researcher	0,2
		A. Artikov	DLNP	head of sector	0,3
		N. Atanov	DLNP	researcher	0,3
		D. Baigarashev	VBLHEP	junior researcher	0,5
		A. Baldin	VBLHEP	head of department	0,4
		E. Baldina	VBLHEP	senior researcher	0,5
		V. Baranov	DLNP	researcher	0,5
		Ver. Bleko	VBLHEP	head of group	0,4
		V. Bleko	VBLHEP	head of sector	0,4
		D. Bogoslovskii	VBLHEP	senior researcher	0,3
		A. Boikov	DLNP	junior researcher	0,5
		A. Bolshakova	DLNP	researcher	0,5
		V. Borisov	VBLHEP	head of sector	0,1
		M. Bures	LIT	senior researcher	0,5
		E. Bushmina	VBLHEP	intern researcher	0,3
		V. Chalyshev	DLNP	senior researcher	0,5
		V. Chmill	VBLHEP	leading researcher	0,8
		D. Choheli	DLNP	senior researcher	0,3
		A. Chukanov	DLNP	senior researcher	0,3
		A. Datta	DLNP	senior researcher	1
		Yu. Davydov	DLNP	head of department	0,3
		D.Dedovich	DLNP	researcher	0,6
		M. Demichev	DLNP	researcher	0,2
		I. Denisenko	DLNP	head of sector	0,8
		A.Didorenko	LIT	intern researcher	0,5
		M.-T. Dima	DLNP	junior researcher	1
		M.-O. Dima	DLNP	leading researcher	1
		V. Dunin	VBLHEP	senior researcher	0,5
		T. Enik	VBLHEP	head of group	0,7
		V. Frolov	DLNP	researcher	0,4
		A. Galoyan	VBLHEP	leading researcher	0,5
		O. Gavrishchuk	VBLHEP	leading researcher	0,8
		L. Gladilin	DLNP	leading researcher	0,5
		S. Golubykh	VBLHEP	senior researcher	0,7
		A. Gongadze	DLNP	head of sector	0,3
		N. Greben	LIT	intern researcher	1
		A. Gridin	DLNP	researcher	0,5
		K. Gritsay	DLNP	researcher	0,8
		Yu. Gurchin	VBLHEP	researcher	0,2
		A. Guskov	DLNP	deputy director of laboratory	0,6
		N. Huseynov	DLNP	leading researcher	0.4

		A. Isupov	VBLHEP	leading researcher	0,3
		A. Ivanov	VBLHEP	researcher	1
		N. Ivanov	VBLHEP	senior researcher	0,5
		V. Karjavin	VBLHEP	head of department	0,2
		A. Karpishkov	DLNP	researcher	0,5
		G. Kekelidze	VBLHEP	head of sector	0,5
		D. Kereibay	VBLHEP	junior researcher	0,5
		S. Khabarov	VBLHEP	senior researcher	0,3
		P. Kharyuzov	VBLHEP	head of group	0,5
		E. Klevtsova	VBLHEP	deputy head of Department	0,4
		E. Kokoulina	VBLHEP	head of group	0,5
		B. Kostenko	LIT	senior researcher	0.3
		A. Korzenev	VBLHEP	head of department	1
		V. Kramarenko	VBLHEP	senior researcher	0,5
		U. Kruchonak	DLNP	researcher	0,3
		Yu. Kulchitsky	DLNP	head of sector	0,4
		A. Kulikov	DLNP	advisor to laboratory directorate	1
		V. Kurbatov	DLNP	senior researcher	1
		Zh. Kurmanaliev	DLNP	junior researcher	0,5
		S. Kutuzov	DLNP	researcher	1
		E. Ladygin	VBLHEP	leading researcher	1
		V. Ladygin	VBLHEP	head of department	0,3
		R. Lednicki	VBLHEP	chief researcher	0,1
		V. Lysan	VBLHEP	researcher	0,2
		D. Madigozhin	VBLHEP	head of sector	0,2
		A. Maltsev	DLNP	researcher	0,5
		M. Mineev	LIT	researcher	0,3
		S. Movchan	VBLHEP	head of sector	0,2
		Y. Mukhamejanov	VBLHEP	senior researcher	0,3
		A. Mukhamejanova	VBLHEP	junior researcher	0,3
		D. Myktybekov	VBLHEP	junior researcher	0,3
		D. Nikiforov	VBLHEP	head of department	0,4
		V. Nikitin	VBLHEP	chief researcher	0,1
		D. Oleynik	LIT	senior researcher	1
		A. Olshevsky	DLNP	head of department	0,2
		G. Ososkov	LIT	chief researcher	0,3
		V. Perelygin	VBLHEP	senior researcher	0,2
		A. Petrosyan	LIT	senior researcher	1
		M. Petrov	VBLHEP	head of group	0,2
		A. Piskun	DLNP	junior researcher	0,8
		V. Popov	VBLHEP	senior researcher	0,3
		F. Prokoshin	DLNP	senior researcher	1
		S. Reznikov	VBLHEP	senior researcher	0,3
		N. Rogacheva	VBLHEP	senior researcher	1
		A. Rybnikov	DLNP	researcher	0,2
		K. Salamatin	VBLHEP	researcher	0,5
		V. Saleev	BLTP	leading researcher	0,5
		O. Samoylov	DLNP	head of department	0,3
		A. Selyunin	DLNP	researcher	0,2
		V. Shalaev	VBLHEP	junior researcher	0,3
		V. Sharov	DLNP	junior researcher	0,3
		S. Shimansky	VBLHEP	senior researcher	0,5
		A. Shipilova	DLNP	senior researcher	0,5
		S. Shkarovskiy	VBLHEP	senior researcher	0,3
		S. Shmatov	LIT	director of laboratory	0,2
		K. Shtejer	DLNP	senior researcher	1
		A. Simonenko	DLNP	senior researcher	0,5
		A. Skachkova	DLNP	senior researcher	1

		A. Terekhin	VBLHEP	researcher	0,3
		V. Tereshchenko	DLNP	head of group	0,3
		O. Teryaev	VBLHEP/ BLTP	associate director	0,3
		A. Tropina	DLNP	junior researcher	0,4
		E. Usenko	VBLHEP	researcher	0,5
		V. Uzhinsky	LIT	leading researcher	0,3
		Yu. Uzikov	DLNP	leading researcher	0,5
		A. Verkheev	DLNP	senior researcher	0,5
		L. Vertogradov	DLNP	consultant at laboratory directorate	1
		N. Voitishin	LIT	deputy director of laboratory for scientific work	0,3
		P. Volkov	VBLHEP	junior researcher	0,3
		I. Yeletskikh	DLNP	senior researcher	0,5
		N. Zamiatin	VBLHEP	head of sector	0,5
		E. Zemlyanichkina	VBLHEP	head of sector	1
		A. Zhemchugov	DLNP	deputy head of department	0,4
		A. Zhevlakov	BLTP	senior researcher	0,2
		I. Zhizhin	VBLHEP	junior researcher	0,3
		N. Zhuravlev	DLNP	consultant at laboratory directorate	0,9
		I. Zimin	DLNP	researcher	0,4
		D. Zolotykh	VBLHEP	head of group	0,2
2.	engineers	51			23
		V. Anosov	VBLHEP	leading engineer	1
		N. Azorskiy	VBLHEP	leading engineer	0,3
		K. Basharina	VBLHEP	development engineer of 2nd category	0,5
		V. Bautin	VBLHEP	engineer	0,5
		E. Belyaeva	VBLHEP	development engineer of 1st category	0,5
		Yu. Bespalov	VBLHEP	senior engineer	0,2
		D. Budkouski	VBLHEP	engineer	0,5
		A. Chetverikov	DLNP	electronics engineer of 2nd category	0,3
		S. Chetverikov	VBLHEP	engineer	0,4
		D.Chemezov	VBLHEP	engineer	0,3
		S. Gerasimov	VBLHEP	development engineer of 1st category	0,2
		Y. Kambar	VBLHEP	engineer	0,5
		I. Kapitonov	VBLHEP	engineer	0,5
		Yu. Kopylov	VBLHEP	engineer	0,3
		D. Korovkin	VBLHEP	senior engineer	0,4
		E. Kostyukhov	VBLHEP	leading engineer	0,3
		A. Kotova	VBLHEP	engineer	0,2
		N. Kovyazina	DLNP	engineer	0,8
		M. Kozhin	VBLHEP	engineer	1
		V. Kozhukalov	DLNP	engineer	0,5
		V. Kukharev	VBLHEP	leading engineer	0,4
		K. Kuznetsova	DLNP	engineer	0,5
		A. Livanov	VBLHEP	leading engineer	0,5
		K. Loshmanova	VBLHEP	engineer	0,2
		I. Lyashko	DLNP	engineer	0,7
		K. Mikhailov	VBLHEP	leading engineer	0,3
		O. Minko	VBLHEP	leading engineer	1
		S. Nagorniy	VBLHEP	leading engineer	0,5
		S. Romakhov	VBLHEP	engineer	0,5
		N.Sagimbaeva	VBLHEP	senior engineer	0,4
		A. Safonov	VBLHEP	senior engineer	0,4
		A. Samartsev	DLNP	development engineer of 1st	1

				category	
		A. Savenkov	VBLHEP	engineer	0,3
		S. Seryubin	DLNP	engineer	0,5
		A. Sheremeteva	VBLHEP	engineer	0,3
		A. Shunko	VBLHEP	development engineer of 1st category	0,3
		S. Sinelshchikova	VBLHEP	engineer	0,3
		S. Sokolov	DLNP	senior engineer	0,3
		S. Starikova	VBLHEP	engineer	0,3
		E. Streletskaya	VBLHEP	engineer	0,3
		O. Tarasov	VBLHEP	senior engineer	0,3
		A. Tishevsky	VBLHEP	engineer	0,3
		V. Tokmenin	DLNP	engineer	1
		N. Topilin	VBLHEP	deputy chief engineer of laboratory	0,1
		Yu. Troyan	VBLHEP	software engineer	0,4
		E. Vasilieva	VBLHEP	senior engineer	0,3
		A. Vasyukov	DLNP	engineer	0,5
		Yu. Vertogradova	DLNP	engineer	1
		I. Volkov	VBLHEP	engineer	0,3
		Yu. Yershov	VBLHEP	leading engineer	0,3
		E. Zubarev	VBLHEP	senior engineer	0,3
3.	specialists	4			1.2
		D. Fedoseev	DLNP	leading electronics engineer	0,2
		S. Kakurin	VBLHEP	chief technical specialist	0,5
		V. Pavlov	VBLHEP	senior technician	0,2
		S. Sukhovarov	VBLHEP	leading mechanical design engineer	0,3
4.	technicians	10			5.6
		K. Asadova	VBLHEP	laboratory assistant	0,5
		M. Dima	DLNP	laboratory assistant	1
		A. Gazzaev	DLNP	senior laboratory assistant	0,5
		Z. Khabaev	LIT	laboratory assistant	0.5
		A. Konak	LIT	laboratory assistant	0,5
		P. Lensky	DLNP	laboratory assistant	0,5
		I. Pudin	VBLHEP	laboratory assistant	1
		D. Rusov	DLNP	laboratory assistant	0,5
		A. Zinin	VBLHEP	mechanic of experimental stands and installations	0,3
	Total:	**193**			**93.8**

3.2.2. JINR associated personnel

No.	Category of personnel	Partner organization	Amount of FTE
1.	research scientists		7,3
		MEPhI	13x0.3 = 3.9
		SINP MSU	3x0.3 = 0.9
		PNPI	5x0.3+2x0.5 = 2.5
2.	engineers		
3.	specialists		
4.	technicians		

	Total:		**7.3**

4. Financing

4.1 Total estimated cost of the project/LRIP subproject

The total cost estimate of the project (for the whole period, excluding salary).
The details are given in a separate table below.

66 300 000 $

4.2 Extra funding sources

Expected funding from partners/customers – a total estimate.

13 300 000 $

Project (LRIP subproject) Leader __________/___________/

Date of submission of the project (LRIP subproject) to the Chief Scientific Secretary: _________
Date of decision of the laboratory's STC: _________ document number: _________

Year of the project (LRIP subproject) start: ________________

(for extended projects) – Project start year: _______

Proposed schedule and resource request for the Project / LRIP subproject

Names of costs, resources, funding sources			**Cost (millions of US dollars) / Resource request**	**Proposal from the laboratory for allocation of funding and resources**				
				1 year	2 year	3 year	4 year	5 year
		International cooperation	0.5	0.1	0.1	0.1	0.1	0.1
		Materials	51.5	5.0	13.5	15.5	9	8.5
		Equipment, Third-party company services	12.0	1.3	4.1	2.1	2.2	2.3
		Commissioning						
		R&D contracts with other research organizations	1.5	0.5	0.4	0.3	0.2	0.1
		Software purchasing	0.2	0.1	0.1	0	0	0
		Design/construction	0.6	0.2	0.3	0.1	0	0
		Service costs (*planned in case of direct project affiliation)*						
Resourcesrequired	**Standardhours**	Resources						
		– theamountofFTE,	-	116	140	140	140	140
		– accelerator/installation,	2000	0	500	500	500	500
		– reactor,…						
Sourcesoffunding	**JINR Budget**	JINR budget*(budgetitems)*	53	7.0	15.5	14.5	8.4	7.6
	Extrafudning (supplementaryestimates)	Contributions by partners	2.4	0.1	0.5	0.5	0.6	0.7
		Funds under contracts with customers Other sources of funding	10.9	0.1	2.5	3.1	2.5	2.7

Project (LRIP subproject) Leader_________/________________/

Laboratory Economist _________/________________/

APPROVAL SHEET FOR PROJECT / LRIP SUBPROJECT

TITLE OF THE PROJECT/LRIP SUBPROJECT

SHORT DESIGNATION OF THE PROJECT / SUBPROJECT OF THE LRIP

PROJECT/LRIP SUBPROJECT CODE

THEME / LRIP CODE

NAME OF THE PROJECT/ LRIP SUBPROJECT LEADER

AGREED

JINR VICE-DIRECTOR	____________ SIGNATURE	____________ NAME	____________ DATE
CHIEF SCIENTIFIC SECRETARY	____________ SIGNATURE	____________ NAME	____________ DATE
CHIEF ENGINEER	____________ SIGNATURE	____________ NAME	____________ DATE
LABORATORY DIRECTOR	____________ SIGNATURE	____________ NAME	____________ DATE
CHIEF LABORATORY ENGINEER	____________ SIGNATURE	____________ NAME	____________ DATE
LABORATORY SCIENTIFIC SECRETARY	____________ SIGNATURE	____________ NAME	____________ DATE
THEME / LRIP LEADER	____________ SIGNATURE	____________ NAME	____________ DATE
PROJECT / LRIP SUBPROJECT LEADER	____________ SIGNATURE	____________ NAME	____________ DATE

APPROVED BY THE PAC	____________ SIGNATURE	____________ NAME	____________ DATE