Memorandum of Understanding № 01/1-89-36 спбгу

for performing the MPD Experiment for Studies of Baryonic Matter at the NICA Collider between the MPD Collaboration, Joint Institute for Nuclear Research, Dubna (hereinafter referred to as "JINR") as the Host Laboratory and the MPD Collaborating Institutions (hereinafter referred to as "the Collaborating Institution" or "the Institution"):

Preamble

A group of Institutes from the JINR Member and Non-Member States and JINR have agreed to collaborate in order to perform experiments for studies of baryonic matter at the NICA Collider with the MPD detector and to form the MPD Collaboration (the list of Institutions participating in the MPD Collaboration is presented in Annex 1). This Memorandum of Understanding (MoU) defines the Collaboration and establishes the policy, mutual obligations and responsibilities of the Parties and in particular it defines the rights and obligations of each Collaborating Institution. This MoU is not legally binding, but the Institutions recognize that the success of the Collaboration depends on all its members adhering to its provisions. Any default will be dealt with by the Institutional Board (IB) of the Collaboration.

Article 1. Parties to this MoU

The Parties to this MoU shall be the Collaboration, represented by the Spokesperson, the Collaborating Institutions as listed in Annex 1, each one represented by its group leader and a relevant authority of the Institution, and JINR as the Host Laboratory, represented by its Vice Director.

Article 2. Purpose of this MoU

This MoU defines the distribution of responsibilities among the Parties for the execution of the experimental program of the MPD Experiment. Regulations for the organization and management of the MPD Collaboration are specified in the "Bylaws of the MPD Collaboration" presented in Annex 2 and in any future amendment of these Bylaws as adopted by the MPD Collaboration and posted on the MPD website.

This MoU is signed by the Collaboration, represented by the Spokesperson, JINR, represented by its Vice Director and each one of the Collaborating Institutions, represented by its group leader and a relevant authority of the Institution. In addition to that, Annex 3 specifies the responsibilities and contributions of each Collaborating Institution. There shall be one Annex 3 for each Collaborating Institution.

Article 3. Duration of this MoU and its Extension

3.1 This MoU shall enter into force on the date of its signature and shall remain in force until the Vice Director of JINR in agreement with the Spokesperson has declared the MPD Experiment completed, the equipment has been dismantled, the arrangements for its disposal have been agreed in writing, and the Collaboration has been dissolved.

3.2 Notwithstanding the foregoing, the document "Regulation for the organization of experiments conducted by international collaborations using the capabilities of the JINR basic facilities" also referred to as "Regulation of Experiments at JINR" (Annex 4) shall remain in force.

3.3 Any Collaborating Institution may terminate its participation in the MPD Experiment by giving notice in writing to the Collaboration at least six months in advance. In such an event, the termination procedure shall be negotiated with the Collaboration in accordance with the conditions outlined in the "Regulation of Experiments at JINR". In particular, any detector component or equipment provided by the Institution shall remain at the disposal of the Collaboration until the MPD Experiment is declared completed.

3.4 Any Institution that wishes to join the Collaboration during the period of validity of this MoU will be expected to sign this MoU and to make an appropriate contribution to the Experiment. This shall be negotiated between the Institution and the Collaboration and shall be summarized as an additional document in Annex 3 as outlined in Article 2.

Article 4. Obligations of JINR as the Host Laboratory

4.1 The general obligations of JINR as the Host Laboratory and of the Collaborating Institutions are contained in the "Regulation of Experiments at JINR". This document is an integral part of this MoU and is attached as Annex 4.

4.2 All equipment brought to the JINR site must comply with the JINR safety regulations. If relevant, the design, test criteria, and testing of equipment should be discussed well in advance with the JINR safety officials. All equipment brought to JINR must be accessible for inspection by the Chief Engineer of the MPD Experiment.

Article 5. Responsibilities of Collaborating Institutions

5.1 The list of the Collaborating Institutions presently responsible for the execution of the MPD Experiment is given in Annex 1. The specific contributions and responsibilities of each Collaborating Institution are outlined in Annex 3.

5.2 The responsibilities for conducting the MPD Experiment at JINR are shared by the Collaborating Institutions according to the expertise needed for specific studies. An overview of the distribution of responsibilities among the Collaborating Institutions with respect to the construction, maintenance, and operation of the Experiment, as well as data calibration, reconstruction, and analysis is given in Annex 5. The distribution of responsibilities will be reviewed and modified as needed by the MPD management.

5.3 Each Collaborating Institution shall supply manpower for shift work during data taking periods. The number of such people should be in proportion to the number of members of the Collaborating Institutions.

5.4 The Collaborating Institutions are expected to participate in the operational phase of the project and in the scientific exploitation of the data acquired as outlined in "Regulation of Experiments at JINR" (Annex 4) and in the MPD Bylaws.

Article 6. Administrative and Financial Provisions

6.1 A Finance Review Committee (FRC) shall be established by JINR to monitor the general financial and manpower support and approve the annual construction, maintenance, and operation budgets of the MPD Experiment. The FRC comprises the representatives of the Funding Agencies of the Collaborating Institutions contributing to the MPD budget, the managements of JINR and the Collaboration.
The Project Manager has spending authority on the MPD budget and he shall report regularly to the FRC on the status of the experiment, financial, administrative matters and on the composition of the Collaboration.

6.2 To support the operating costs of the experimental effort at JINR, a Common Fund Account shall be established for the MPD Experiment. The MPD IB shall determine the annual budget of the Common Fund according to the needs of the Experiment but not exceeding the amount of 400 kEuros. The MPD IB shall also determine the amount that each Collaborating Institution shall contribute to the Common Fund. If an institution cannot pay

in cash its contribution to the CF, in-kind contribution shall be allowed. See Annex 6 for more details on the CF.

6.3 The Common Fund shall be devoted to cover incidental expenses of the MPD experiment, including, but not limited to, material cost, support for the organization of collaboration meetings, services performed by JINR or by outside personnel on the JINR site, fabrication charges from internal and external machine shops, and other expenses incurred by the Collaboration members during the construction, maintenance, and operation of the MPD Experiment at JINR.

6.4 Spending authority for the Common Fund shall rest with the Project Manager of the MPD Experiment. The Project Manager shall report regularly to the FRC on the use of the Common Fund.

Article 7. Assignment

None of the Parties shall assign its rights or responsibilities under this MoU without prior written approval by the other Parties.

Article 8. Observance of this MoU and Regulation of Experiments at JINR

8.1 This MoU is not legally binding, but the Collaborating Institutions recognize that the success of the Collaboration depends upon all its members adhering to its provisions. Any default shall be dealt with, in the first instance, by the Collaboration and if necessary then by the resolution mechanism defined in the "Regulation of Experiments at JINR" (Annex 4).

8.2 Notwithstanding the foregoing, the provisions of the "Regulation of Experiments at JINR" are binding.

Article 9. Amendments

This MoU may be amended at any time with the agreement of its signatories or of their appointed successors. Any such amendments will be subject to the prior agreement of the MPD IB.

Article 10. Disputes

Any dispute between the Collaborating Institution and JINR will be resolved using standard JINR procedures for the resolution of such disputes. Any dispute between the Collaborating Institutions will be resolved according to the Collaboration procedures.

Article 11. Annexes

All the Annexes are an integral part of this MoU. They are understood to be the planning basis for the operation of the Experiment.

ANNEXES

Annex 1:
Institutions in the MPD Collaboration

Annex 2:
Bylaws of the MPD Collaboration

Annex 3:
Specific contributions of the **Federal State Budgetary Educational Institution of Higher Education "Saint-Petersburg State University" (SPbSU)**

Annex 4:
Regulation of Experiments at JINR

Annex 5:
Overview of the distribution of responsibilities among the Collaborating Institutions in the MPD Experiment

Annex 6:
Annex to MoU on the MPD Common Fund

Signatures

The undersigned Parties declare that they agree on to the present Memorandum of Understanding for the MPD Experiment.

For JINR:

Prof. Dr. G. Trubnikov
Director

06.02.2023г

Date:

For the MPD Collaboration:

Prof. Victor Riabov
MPD Collaboration Spokesperson

Date:

For Institute Name:

Sergei Mikushev
Title: Vice-Rector for Research, SPbU

Date:

Dr.Grigory Feofilov
Group Leader

Date:

Annex 1. Institutions participating in the MPD Collaboration

ARMENIA

A. Alikhanyan National Laboratory of Armenia

AZERBAIJAN

National Nuclear Research Center, Baku

BULGARIA

Plovdiv University "Paisii Hilendarski", Plovdiv

CHILE

U. Tecnica Federico Santa Maria, Valparaiso

CHINA

Central China Normal University
Fudan University, Shanghai
Huzhou University
Institute of Modern Physics, CAS, Lanzhou
Shandong University, Qingdao
Three Gorges University
Tsinghua University, Beijing
University of Chinese Academy of Sciences, Beijing
University of Science and Technology, Hefei
University of South China

CZECH Republic

Nuclear Physics Institute CAS, Řež
Palacky University, Olomouc

GEORGIA

Tbilisi State University, Tbilisi

MEXICAN Consortium

Benemérita Universidad Autónoma de Puebla
Centro de Investigación y de Estudios Avanzados
Instituto de Ciencias Nucleares, UNAM
Universidad Autónoma de Sinaloa
Universidad Autonoma Metropolitana, Unidad Iztapalapa
Universidad de Colima
Universidad de Sonora

MOLDOVA

Institute of Applied Physics, ASM, Chisinau

POLAND

Institute of Nuclear Physics, Polish Academy of Science, Krakow

Jan Kochanowski University
National Center for Nuclear Reseach, Otwock – Swierk
University of Silesia, Katowice
University of Warsaw, Warsaw
University of Wroclaw, Wroclaw
Warsaw University of Technology, Warsaw

RUSSIAN Federation

Belgorod State University
Institute for Nuclear Research of the RAS (INR RAS), Moscow
Joint Institute for Nuclear Research (JINR), Dubna
National Research Center "Kurchatov Institute", Moscow
Moscow Institute of Physics and Technology (MIPT), Moscow
National Research Center "Kurchatov Institute" - ITEP, Moscow
NRC «Kurchatov Institute» - PNPI, Gatchina
National Research Nuclear University MEPhI, Moscow
North Ossetia State University, Vladikavkaz
Skobeltsyn Institute of Nuclear Physics, Moscow State University (SINP MSU), Moscow
Saint Petersburg State University (SPbU), St. Petersburg

SERBIA

Vinca Institute of Nuclear Science

Annex 2. Bylaws of the MPD Collaboration

The MPD bylaws were adopted at the first MPD Collaboration meeting on April 13, 2018.They can be seen at:

http://mpd.jinr.ru/experiment/organization/bylaws/

Any future amendment of the bylaws shall be posted on the same site.

Annex 3. Specific contributions of the **Federal State Budgetary Educational Institution of Higher Education "Saint-Petersburg State University" (SPbU)**

The current composition of the group

The Group of the Saint-Petersburg State University participating in the MPD Collaboration presently consists of 11 leading researchers, 7 engineering and technical workers, 4 PhD students and 8 students. The size of the Group is expected to grow further.

G.A. Feofilov – Ph.D, Associate Professor, Head of the Laboratory of Ultrahigh Energy Physics, Group Leader,
V.V. Vechernin - Dr.Sci, Professor,
V.I. Zherebchevsky – Ph.D, Associate Professor, Head of the Educational Laboratory of Nuclear Processes,
F.F. Valiev - Dr.Sci, Professor,
V.N. Kovalenko – Ph.D, Associate Professor,
E.V. Andronov – Ph.D, senior lecturer,
N.A. Maltsev – Ph.D, senior lecturer,
A.K. Zarochentsev – researcher at the Laboratory of Ultrahigh Energy Physics,
A.M. Puchkov – Ph.D, researcher at the Laboratory of Ultrahigh Energy Physics,
V.A. Rudnev - Dr.Sci, Associate Professor,
A.Yu. Seryakov - junior researcher at the Laboratory of Ultrahigh Energy Physics,

S.N. Igolkin - leading engineer at the Laboratory of Ultrahigh Energy Physics,
N.A. Prokofiev - leading engineer at the Educational Laboratory of Nuclear Processes,
V.K. Lysov - engineer at the Laboratory of Ultrahigh Energy Physics,
N.A. Makarov - electronic engineer at the Educational Resource Center of SPbSU in Physics,
V.N. Popov - engineer at the Department of Technical Support of Educational Programs of SPbSU,
V.M. Misheneva - research engineer at the Laboratory of Ultrahigh Energy Physics,
O.V. Sobol - laboratory researcher at the Laboratory of Ultrahigh Energy Physics,

D.S. Prokhorova - PhD student (PhD in 2024), junior researcher at the Laboratory of Ultrahigh Energy Physics,
S.N. Belokurova – PhD student (PhD in 2024), research engineer at the Laboratory of Ultrahigh Energy Physics,
V.V. Petrov - PhD student, technician at the Educational Laboratory of Nuclear Processes,
A.P. Zvyagina - PhD student, laboratory researcher at the Laboratory of Ultrahigh Energy Physics,

S.V. Yurchenko – master's student, laboratory researcher at the Laboratory of Ultrahigh Energy Physics,
A.A. Marova - master's student, laboratory researcher at the Laboratory of Ultrahigh Energy Physics,
V.P. Mikhailovsky - student, laboratory researcher at the Laboratory of Ultrahigh Energy Physics,
N.E. Kakhanovskaya - student, laboratory researcher at the Laboratory of Ultrahigh Energy

Physics,
N.I. Kalinichenko – master's student, laboratory researcher at the Laboratory of Ultrahigh Energy Physics,
K.A. Galaktionov - master's student,
A.G. Gordienko - student,
S.E. Gora – student.

The group has considerable experience since 1992 from the research and development for ALICE Inner Tracking System (ITS) that succefully was in operation from 2008 till 2018, and from NA61/SHINE preparations and operation starting feom 2006. Participation in the developments of the physics progarmme for ALICE and NA61/SHINE6, in the experiemnatal data analysis, as well to the coordination of russian grid cites working in the WLCG, add to the list of team activity.
Capitalizing on this experience the group plans to contribute in the following items:

1) Contribution to the physical programme:
-- Development of theoretical analysis of processes at the initial stages of hadron collisions. Optimization of methods for selecting event classes. Study of correlations and fluctuations of various quantities using new high-intensity observables that are sensitive to transitions between the states of hadronic matter and are resistant to trivial effects. Search for signs of critical behavior in hadronic matter based on experimental data of Bi+Bi collisions. Study of cumulative phenomena in the new kinematic region of central rapidities and large transverse momenta in the MPD and SPD experiments at the NICA collider (Note: this cumulative region is absolutely inaccessible at the LHC and RHIC).

2) Participation in the creation of the MPD Internal Tracking System (ITS-MPD):
--Creation of new experimental stands for studying the characteristics of pixel detectors for ITS-MPD,
-- Development and creation of new extra lightweight mechanical support structures for ITS-MPD pixel detectors.
-- Development and creation mechanics and cooling system for ITS-MPD

3) Development and creation of the fast beam-beam collision detector (FBBC) based on the microchannel plates (MCP) -- as an event trigger for the MPD, the luminosity monitor, and detector of precise timing and position of the collision point.

4) Participation in the work on the creation of a system for processing and storing data from the MPD NICA experiment.

Annex 4. Regulation of Experiments at JINR

The regulations governing the organization of experiments conducted by international collaborations at JINR facilities were established by the JINR management on January 24, 2017 and can be found at: _

http://www.jinr.ru/wp-content/uploads/JINR_Docs/Regulation_for_the_organization_of_experiments_eng.doc

Annex 5. Overview of the Distribution of Responsibilities among the Collaborating Institutions in the MPD Experiment

Detectors, sub-systems	Tasks	Responsible Institutions
TPC		
TOF		
ECal		
FFD		
FHCal		
Inner Tracking System (ITS)		SPbU
Beam line / beam pipe		
Infrastructure of experimental zone, magnets, beam monitors		SPbU
DAQ		
Computing		
Online farm		
Safety		
Slow control		
Database		
Detector calibration		
Detector positioning / alignment		
Online monitoring		
Software development		
Reconstruction algorithms		
Event reconstruction		
Detector simulation		
Physics analysis		SPbU

Annex 6. Annex to MoU on the MPD Common Fund (CF)

This Annex provides additional and specific information on the MPD Common Fund.

Guidelines:

The Institutional Board has adopted the following scheme for the implementation of the CF:

1. Only members of the author list who received their PhD more than 5 years ago are counted as eligible paying members for the CF.

2. The contribution of a given institution shall be proportional to the number of eligible paying members of that institution, up to a maximum of 5 paying members.

3. If an institution cannot pay in cash its contribution to the CF, in-kind contribution shall be allowed. For example, one month of service work at JINR by a PhD student (post-doc/technician/engineer) shall be counted as a contribution of 50,000 Rubles to the CF.

4. In exceptional cases, the IB could adjust the number of eligible paying members of an institution.

CF Budget

The CF budget is established on an annual basis. It shall be submitted by the Project Manager to the IB for discussion and approval. For the years 2021-2025, it is estimated that the annual budget will change within reasonable limits dictated by the needs of the Collaboration, and in all cases shall not exceed 7 Million Rubles. It is estimated that the annual contribution per eligible paying member will stay approximately constant, at the level of 50,000 Rubles, or even decrease over this 5 year period to the extent that the collaboration grows over time.