

Memorandum of Understanding

for the Maintenance and Operation of the Scattering and Neutrino Experiment at LHC (SND@LHC Experiment)

between

The EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH, “CERN”,
an Intergovernmental Organization having its seat at Geneva, Switzerland,
as Host Laboratory

on the one hand,

and

the Collaborating Institutions/Funding Agencies of the SND@LHC Collaboration

on the other hand

WHEREAS

- (a) A group of institutions from CERN Member and non-Member States and CERN, (“the Collaborating Institutions”), listed in **Annex 1**, have proposed to CERN to carry out an experiment (“the Experiment”) to perform measurements with neutrinos produced at the LHC Interaction Point 1. The Collaborating Institutions have secured the support of their Funding Agencies to enable their participation in the SND@LHC Collaboration (“the Collaboration”);
- (b) Agreement to establish the Collaboration has been effected through the signature of the Memorandum of Understanding for Construction (CERN-MoU-2021-034) (the “Construction MoU”) between CERN as Host Laboratory and the Collaborating Institutions/Funding Agencies participating in the Construction. The Construction MoU defines the Collaboration and its objectives and the rights and obligations of the Collaborating Institutions in construction matters during the construction period;

IT IS HEREWITH UNDERSTOOD AS FOLLOWS:

Article 1. Parties to the M&O MoU

- 1.1 The parties to the M&O MoU are CERN as Host Laboratory and the Collaborating Institutions listed in **Annex 1** (“the Parties”). **Annex 2** lists the Funding Agencies of the Collaboration. A Funding Agency may be a Collaborating Institution or a body acting on behalf of one or more Collaborating Institutions in the conclusion of the M&O MoU.

Article 2. Purpose of the M&O MoU

- 2.1 The M&O MoU sets out organisational, managerial and financial guidelines to be followed by the Collaboration in the pre-exploitation and exploitation phases of the SND@LHC experiment. Its purpose is to define and determine the M&O contributions and expenditures in these phases and the procedures and mechanisms by which such M&O contributions are shared and, together with the expenditures, reviewed amongst the Parties.
- 2.2 The exploitation phase starts when data-taking for physics at the LHC has commenced; it ends when the data analysis has finished. The pre-exploitation phase refers to the period beforehand, starting after the construction; it comprises in particular the commissioning period for individual sub-detector/system components of the SND@LHC detector.
- 2.3 For the purpose of this document, M&O comprises all activities required to operate and keep in good working order the SND@LHC detector and all its individual components along with their respective infrastructure and facilities. This includes the operation of the Dark Room and Scanning facilities. M&O also comprises the SND@LHC Collaboration co-ordination and the data analysis.

Article 3. Responsibilities of the Collaborating Institutions

Subject to the provisions of this MoU, the Collaborating Institutions shall:

- 3.1 Make a substantial contribution to the execution of the Experiment, taking clear commitments, in particular participate in M&O activities and contribute a fair and equitable share to the funding of their costs;
- 3.2 Nominate a member representing each Collaborating Institution;
- 3.3 Ensure that all team members of the Collaborating Institutions working on the Experiment are registered in the CERN Greybook.

Article 4. CERN's responsibilities as Host Laboratory¹

- 4.1 CERN's general obligations as Host Laboratory are set out in the General Conditions.

Article 5. The Equipment

- 5.1 The Equipment is described in detail in the Experimental Proposal [CERN-LHCC-2021-003; LHCC-P-016]. It is listed in **Annex 3** of the Construction MoU.

Article 6. Collaboration

- 6.1 The management structure of the Collaboration is set out in **Annex 5.1** of the Construction MoU. Persons currently holding management positions are listed in **Annex 5.2** of the Construction MoU.
- 6.2 The technical participation of the Collaborating Institutions in detector construction, grouped by Funding Agency, is set out in **Annex 4** of the Construction MoU.

Article 7. Common Fund (CF)

- 7.1 The CF is set up to fund activities of the Collaboration, including the M&O of the Experiment.
- 7.2 The Common Fund Accounts ("CF Accounts") will be opened in the name of the Collaboration at CERN under the responsibility of the Resources Co-ordinator. All payments made by CERN on behalf of the Collaboration and the related receipts will be shown in the CF Accounts.
- 7.3 The funding of M&O expenditures shall be shared amongst the Collaborating Institutions or their Funding Agencies, as the case may be, in proportion to the number of their scientific staff holding a PhD or an equivalent qualification and who are entitled to be named as authors of

¹ As a Collaborating Institution, CERN is subject to the responsibilities described in Article 3.

scientific publications of the Collaboration. To this end, the Collaboration shall maintain a list of such authors by Collaborating Institution and/or Funding Agency. The Collaboration shall update this list each year in time for the annual meeting of the Finance Review Committee (FRC) (see **Annex 5** of the Construction MoU) to reflect the situation on 30 September of the current year. **Annex 3** of the present M&O reflects the currently valid status.

- 7.4 Personnel of Collaborating Institutions holding a PhD or an equivalent qualification who have an emeritus status in their Collaborating Institution are not taken into account in the calculation of the funding share.
- 7.5 Theorists participating in the physics programme of SND@LHC are not taken into account in the calculation of the funding share.
- 7.6 Collaborating Institutions or Funding Agencies, as the case may be, shall pay their funding share in cash. Under exceptional circumstances some of the funds may be provided in kind, subject to the approval of the Institutions Board (see **Annex 5** of the Construction MoU).
- 7.7 The Collaborating Institutions and Funding Agencies shall transfer any financial contributions into the CF Accounts before expenses are incurred and payments are made on behalf of the Collaboration. For the avoidance of doubt, if, in exceptional circumstances, such expenses are incurred and payments are made prior to the necessary transfers, the Collaborating Institutions and Funding Agencies shall promptly transfer the outstanding amounts into the CF Accounts.

Article 8. Procedure

- 8.1 The Finance Review Committee (FRC) referred to in **Annex 5** (5.1) of the Construction MoU serves as the Finance Review Body stipulated by the General Conditions. It shall supervise the financial matters of the Collaboration. Each year, the Collaboration shall submit a financial report to the Finance Review Committee (FRC) for approval. The report shall contain the expenditures and revenues of the previous year and their comparison with the previously approved budget plan, the current status of expenditures and revenues of the current year and their comparison with the approved budget plan, and a budget plan for expenditures and revenues including the shares of contributions for the following year.
- 8.2 If, for any reason, the FRC should fail to reach agreement on the M&O costs or on their sharing, the arrangements that it last agreed will continue to apply until a new agreement is reached.

Article 9. Observance of the M&O MoU and the General Conditions

- 9.1 The execution of the Experiment is subject to the General Conditions, which form an integral part of the MoU. The current version, dated 7 December 2020, is set out under **Annex 4**. Unless otherwise agreed by CERN, the most recent version of the General Conditions shall apply to the execution of the Experiment. Any definition not provided for in this MoU shall be set out in the General Conditions.

- 9.2 Save for the provisions of the General Conditions, the present MoU is not legally binding, but the Parties recognise that the success of the Collaboration depends upon their adherence to its provisions. Any default under this MoU shall be dealt with by the Collaboration in consultation with the CERN Management.
- 9.3 For the avoidance of doubt, in case of contradiction or ambiguity, the General Conditions shall prevail over this MoU.

Article 10. Duration of the M&O MoU and its Extension

- 10.1 The M&O MoU is effective from the date of Parties' signatures. It shall be deemed to cover any activity of SND@LHC from 1 January 2022 until 31 December 2025.
- 10.2 The M&O MoU may be extended at any time by mutual agreement of the Parties. Unless a Party objects, mutual agreement can be manifested by an unanimous decision of the Finance Review Committee.

Article 11. Participation of Additional Institutions

- 11.1 Subject to the agreement of the Parties, additional institutions may join the Collaboration at any time during the lifetime of the M&O MoU. Each such event shall give rise to an Addendum to the M&O MoU setting out the specific terms of collaboration for the institution(s) concerned and with explicit mention that the terms of the M&O MoU (including all existing Addenda and Amendments) apply. The terms of collaboration shall be negotiated by the Collaboration, which reserves the right to request additional contributions from such institutions. The addendum shall be signed by CERN as Host Laboratory, by the Spokesperson as representative of the Collaboration, and by the institution(s), for the purposes of signature represented, as the case may be, by their Funding Agency/Agencies.

Article 12. Withdrawal and Termination of Participation of Funding Agencies or Collaborating Institutions

- 12.1 Any Funding Agency may withdraw its support from the Collaboration by giving not less than twelve months' notice in writing to the Spokesperson as representative of the Collaboration and the CERN Director for Research and Computing. In such event, reasonable compensation to the Collaboration shall be negotiated by the Collaboration in consultation with the CERN management and submitted to the FRC for approval.
- 12.2 Any Collaborating Institution may withdraw from the Collaboration in accordance with the General Conditions, the procedures agreed by the Collaboration and by giving notice in writing to its Funding Agency.
- 12.3 In its capacity as Host Laboratory of the SND@LHC Experiment, CERN may terminate the participation of a Collaborating Institution.

Article 13. Amendments

- 13.1 The M&O MoU may be amended at any time in accordance with the General Conditions.
- 13.2 Any amendment is subject to prior agreement of the Institution Board. No amendment shall be valid unless it has written form and is signed by the Parties.

Article 14. Annexes

- 14.1 All Annexes are an integral part of the M&O MoU. The Collaboration Management shall keep up to date the information contained therein. Such updates require the approval by the Institutional Board, but do not require a corresponding signed Amendment.

This MoU is produced in **XXX** original documents, each pair signed by CERN as Host Laboratory and by a Collaborating Institution.

For CERN

For **XXX**

Signed in Geneva

Signed in _____

on _____

on _____

Joachim Mnich
Director for Research and Computing

ANNEXES

- 1. Collaborating Institutions in the Collaboration and the names of their contact persons**
- 2. Funding Agencies of the Collaboration and their representatives**
- 3. SND@LHC Collaboration Scientific staff holding a Ph.D. or an equivalent qualification by Collaborating Institution/Funding Agency**
- 4. CERN General Conditions applicable to the Execution of Experiments**

Annex 1 Collaborating Institutions in the Collaboration and the Names of their Contact Persons

Country	Collaborating Institution	Town	Contact Person
Bulgaria	Sofia University St. Kliment Ohridski	Sofia	M. Bogomilov
CERN	CERN (European Laboratory for Particle Physics)	Geneva	T. Ruf
Chile	SAPHIR (Millennium Institute for Subatomic Physics at the High-Energy Frontier)		S. Kuleshov
Germany	Humboldt University of Berlin	Berlin	H. Lacker
	University of Mainz	Mainz	R. Wanke
Italy	INFN and University of Bari	Bari	A. Pastore
	INFN and University of Bologna	Bologna	M. Dallavalle
	INFN and University of Naples	Naples	A. Di Crescenzo
Japan	University of Nagoya	Nagoya	M. Komatsu
	University of Toho	Toho	S. Ogawa
Korea	GNU (Gyeongsang National University)	Jinju	K. Y. Lee
Netherlands	University of Leiden	Leiden	A. Boyarsky
Portugal	LIP (Laboratório de Instrumentação e Física Experimental de Partículas)	Lisbon	N. Leonardo
Russia	Lebedev, Moscow	Moscow	T. Shchedrina
	Moscow Engineering and Physics Institute (MEPhI)	Moscow	V. Shevchenko
	MISiS (National University of Science and Technology)	Moscow	E. van Herwijnen
	SINP MSU (Skobeltsyn Institute of Nuclear Physics Moscow State University)	Moscow	T. Roganova
Switzerland	EPFL (École Polytechnique Fédérale de Lausanne)	Lausanne	L. Shchutska
	University of Zurich	Zurich	C. Betancourt
Turkey	METU (Middle East Technical University)	Ankara	M. A. Guler
UK	ICL (Imperial College London)	London	A. Golutvin
UK	UCL (University College of London)	London	M. Campanelli

Annex 2 Funding Agencies of the Collaboration and their Representatives

Country	Agency	Town	Represented by
Bulgaria	Sofia University St. Kliment Ohridski	Sofia	A. Gerdjikov
CERN	CERN (Organisation européenne pour la recherche nucléaire)	Geneva	M. Krammer
Chile	SAPHIR (Millennium Institute for Subatomic Physics at the High-Energy Frontier)		S. Kuleshov
Germany	Humboldt University of Berlin	Berlin	H. Lacker
Germany	University of Mainz	Mainz	R. Wanke
Italy	INFN (Istituto Nazionale di Fisica Nucleare)	Rome	A Zoccoli
Japan	JSPS (Japan Society for the Promotion of Science)	Tokyo	M. Komatsu
Korea	GNU (Gyeongsang National University)	Jinju	K. Y. Lee
Netherlands	University of Leiden	Leiden	A. Boyarsky
Portugal	LIP (Laboratório de Instrumentação e Física Experimental de Partículas)	Lisbon	M. Pimenta
Russia	Ministry of Science and Higher Education	Moscow	V. Falkov
Russia	MISiS (National University of Science and Technology)	Moscow	M. Filonov
Switzerland	EPFL (École Polytechnique Fédérale de Lausanne)	Lausanne	L. Shchutska
Switzerland	University of Zurich	Zurich	N. Serra
Turkey	METU (Middle East Technical University)	Ankara	A. Özpıneci
UK	ICL (Imperial College London)	London	A. Golutvin
UK	UCL (University College of London)	London	M. Campanelli

Annex 3

3.1 SND@LHC Collaboration Scientific staff holding Ph.D. or equivalent qualifications by Institution

Reference date: September 30, 2021

Bulgaria

Sofia, Sofia University:

M. Bogomilov, S. Ilieva, G. Vankova-Kirilova,

CERN

CERN, European Laboratory for Particle Physics:

T. Camporesi, F. Cerutti, P. Santos Diaz, A. De Roeck, A. Di Crescenzo, C. Fernandes Vilela, M. Ferro-Luzzi, W. Funk, R. Jacobsson, T. Ruf, M. Sabate Gilarte.

Chile, SAPHIR

Santiago, Universidad Andrés Bello and Millennium Institute for Subatomic Physics at the High-Energy Frontier:

S. Kovalenko, S. Kuleshov, Guo, J.A Zamora Saa, and S. Zhou.

Santiago, Pontificia Universidad Católica de Chile and Millennium Institute for Subatomic Physics at the High-Energy Frontier:

A. Abusleme, F. Garay Walls.

La Serena, Universidad de La Serena and Millennium Institute for Subatomic Physics at the High-Energy Frontier:

J. C. Helo, P. A. Ulloa Poblete, O. J. Soto Sandoval.

Denmark, Danish Natural Science Research Council

Copenhagen, Niels Bohr Institute:

O. Ruchayskiy.

Germany, Humboldt University of Berlin

Berlin, Humboldt University of Berlin:

H. Lacker.

Germany, University of Mainz

Mainz, University of Mainz

R. Wanke.

Italy, INFN

Bari, Dipartimento Interateneo di Fisica and Sezione INFN:

M. De Serio, R. A. Fini, A. Pastore, S. Simone.

Bologna, Dipartimento di Fisica dell'Università and Sezione INFN:

C. Battilana, D. Bonacorsi, A. Castro, F. Cindolo, G. M. Dallavalle, R. Donà, F. Fabbri, F. Lasagni, S. Lo Meo, S. Marcellini, A. Margiotto, F.L. Navarria, A. Perrotta, T. Rovelli, G. P. Siroli, M. Spurio.

Napoli, Dipartimento di Scienze Fisiche and Sezione INFN:

R. Albanese, A. Alexandrov, W. M. Bonivento, S. Buontempo, V. Canale, G. De Lellis, M. de Magistris, R. Fresa, P. Iengo, A. Iuliano, A. Lauria, V. P. Loschiavo, A. Miano, M. C. Montesi, A. Prota, A. Quercia, G. Sekhniaidze, V. Tioukov, A. Ustyuzhanin, C. Visone.

Japan, JSPS

Nagoya, University of Nagoya:

M. Komatsu.

Toho, University of Toho:

T. Naka, S. Ogawa, H. Shibuya.

Korea, GNU (Gyeongsang National University)

Jinju, Gyeongsang National University (GNU):

S. H. Kim, K. Y. Lee, B. D. Park, J. Y. Sohn, C. S. Yoon.

Gwangju, Gwangju National University of Education:

Y. G. Kim.

Seoul, Korea University:

K.S. Lee.

Suwon, Sungkyunkwan University

K. -Y. Choi.

The Netherlands, University of Leiden

Leiden, University of Leiden:

A.Boyarsky.

Portugal, LIP

Lisbon, LIP:

A. Blanco, P. Bordalo, N. Leonardo, S. Ramos.

Russian Federation, Ministry of Science and Higher Education**Moscow, Lebedev Institute:**

M. Chernyavskii, N. Konovalova, N. Okateva, N. Polukhina, T. Shchedrina, N. Starkov.

Moscow, Moscow Engineering and Physics Institute (MEPhI):

V. Shevchenko

Moscow, Moscow State University (MSU):

A. Anokhina, A. Managadze, D. Podgrudkov, T. Roganova.

Russian Federation, National University of Science and Technology (MISiS)**Moscow, MISiS:**

M. Gorshenkov, E. Van Herwijnen.

Spain, CSIC**Madrid, CSIC:**

A. De Rujula.

Switzerland, EPFL**Lausanne, EPFL:**

A. Bay, K. Bondarenko, E. Graverini, G. J. Haefeli, F. Redi, A. B. Rodrigues Cavalcante, O. Schneider, L. Shchutska, I. Timiryasov, E. Zaffaroni.

Switzerland, University of Zurich**Zurich, University of Zurich:**

C. Betancourt, N. Serra.

Turkey, METU**Ankara, Middle East Technical University (METU):**

M. A. Güler, Ç. Kamışcıoğlu.

United Kingdom, ICL

London, Imperial College London (ICL):

A.Golutvin, K. Petridis.

United Kingdom, UCL**London, University College London (UCL):**

M. Campanelli.

3.2 SND@LHC collaboration Scientific staff holding a Ph.D. or equivalent qualification

Funding Agency	Scientists	Theorists or Emeritus
Bulgaria	3	0
CERN	11	0
Chile, SAPHIR	6	2
Denmark, NBI	0	1
Germany, Berlin	1	0
Germany, Mainz	1	0
Italy, INFN	39	1
Japan, JSPS	4	0
Korea, GNU	8	0
Netherlands, Leiden	1	0
Portugal, LIP	2	2
Russia, Ministry of Science and Higher Education	11	0
Russia, MISiS	2	0
Spain, CSIC	0	1
Switzerland, EPFL	7	3
Switzerland, Zurich	2	0
Turkey, METU	2	0
UK, ICL	2	0
UK, UCL	1	0
Total	103	10

Annex 4**CERN General Conditions Applicable to the Execution of Experiments**