

PROJECT ANNEX

TO THE IMPLEMENTING ARRANGEMENT

BETWEEN

**THE MINISTRY OF EDUCATION, UNIVERSITIES AND
RESEARCH OF THE ITALIAN REPUBLIC**

AND

**THE DEPARTMENT OF ENERGY
OF THE UNITED STATES OF AMERICA**

FOR COOPERATION

**IN HIGH ENERGY, ASTROPARTICLE AND NUCLEAR PHYSICS
RESEARCH AND RELATED FIELDS AND TECHNOLOGIES**

**CONCERNING ADVANCED COMPUTING TECHNIQUES AND
QUANTUM INFORMATION SCIENCE AND TECHNOLOGY
FOR HIGH ENERGY AND ASTROPARTICLE PHYSICS**

The Ministry of Universities and Research of the Italian Republic (MUR) and the Department of Energy of the United States of America (DOE), hereinafter referred to as the "Parties":

ACTING pursuant to Section 4 of the Implementing Arrangement between the Ministry of Education, Universities and Research of the Italian Republic and the Department of Energy of the United States of America for Cooperation in High Energy, Astroparticle and Nuclear Physics and Related Fields and Technologies of July 17, 2015, hereinafter referred to as the "Implementing Arrangement";

RECOGNIZING that MUR is the successor agency to the former Ministry of Education, Universities and Research of the Italian Republic for cooperation under the Implementing Arrangement;

NOTING that in the Project Annex to the Implementing Arrangement Concerning Neutrino Physics Research of July 17, 2015 and the Project Annex to the Implementing Arrangement Concerning Accelerator Science and Technology of December 4, 2018, the Parties agreed to cooperate in neutrino physics research and in the research and development of accelerator science and technology, respectively, for the advancement of science and technology in the Parties' countries; and

DESIRING to establish a framework for cooperation and collaboration in the research, development, and associated applications of advanced computing techniques and quantum information science and technology for high energy and astroparticle physics between DOE national laboratories and the Istituto Nazionale di Fisica Nucleare (INFN) under MUR, for the advancement of science and technology in the Parties' countries,

Have agreed as follows:

Section 1 – Objective

- A. The objective of this Project Annex is to establish the framework for specific collaboration in the research, development, and associated applications of advanced computing techniques and quantum information science and technology in high energy and astroparticle physics in the Parties' respective countries. The expected participants in the collaboration are DOE's Fermi National Acceleratory Laboratory ("Fermilab") and MUR's INFN, hereinafter individually referred to as "Participant" or collectively as the "Participants."
- B. This Project Annex is subject to the terms and conditions of the Implementing Arrangement, which is itself subject to the Agreement between the Government of the Italian Republic and the Government of the United States of America for Scientific and Technological Cooperation of April 1, 1988, as amended and extended (the "S&T Agreement"). In the event of any conflict between the provisions of the S&T Agreement or the Implementing Arrangement on the one hand and this Project Annex on the other hand, the provisions of the S&T Agreement and the Implementing Arrangement shall govern.

Section 2 – Areas for Cooperation

Cooperative activities under this Project Annex may include, but are not limited to, the following areas:

- A. Scientific Cooperation

1. Research, development, and associated applications of advanced computing techniques and quantum information science and technology for high energy and astroparticle physics
2. Training of graduate students and junior scientists
3. Analysis of data and dissemination of scholarly publications
4. Exchange of personnel for scientific and/or technical reviews
5. Public engagement and outreach activities

B. Technical Cooperation

1. Advanced computing techniques
 - a. Development of a common set of technical requirements for use of High-Performance Computing (HPC) systems to meet computing needs of high energy and astroparticle physics
 - b. Research and development of computational algorithms and tools, including the migration of programming code and software packages, to HPC environments for high energy and astroparticle physics
 - c. Development, optimization, and access to high-performance machine learning infrastructures, training, and algorithms for high energy and astroparticle physics
2. Quantum information science and technology
 - a. Exploration of technical options and access to existing quantum computing platforms in high energy and astroparticle physics
 - b. Quantum sensing applications, including investigations of high-quality factor microwave cavities operating in low and strong magnetic fields, for high energy and astroparticle physics
 - c. Development and testing of quantum network, transduction, and communication components
 - d. Development of quantum computing technologies and architectures for high energy and astroparticle physics simulations and computations

C. Development of Technical Information

The Parties plan to develop, either independently or jointly, techniques for the scope identified in this Project Annex in conformance with applicable safety standards and computing and cybersecurity rules and regulations.

The development of technical information is planned to be done within the framework of project planning documents and/or other written instruments, as identified in Section 4.F.6 of this Project Annex, to be jointly developed by the Parties' Technical Coordinators designated pursuant to Section 5 of the

Implementing Arrangement. Technical information may be shared with and between the Participants as appropriate.

Section 3 – Participating Organizations

Each Party may invite other government agencies and organizations and private organizations in its country to participate in cooperative activities under this Project Annex, at the participating organizations' own expense and subject to such terms and conditions as the Parties may specify.

Section 4 – Forms of Cooperation

Cooperative activities undertaken pursuant to this Project Annex may include, but are not limited to, the following:

A. Development and Exchange of Technical Information and Experiences, and Collaborative Visits

The Parties plan to develop and exchange, as agreed on a mutually beneficial basis, scientific and technical information regarding, and results of research and development of, the items listed in Section 2 of this Project Annex, in accordance with Section 10 of the Implementing Arrangement. The Parties may arrange collaborative visits of scientific and technical personnel. These visits may address research and development programs for the items listed in Section 2, in accordance with Section 7 of the Implementing Arrangement.

B. Technology Development

The Parties plan to explore the need for demonstrations in order to show the technical and economic feasibility of the technologies in the areas of cooperation set out in Section 2 of this Project Annex.

C. Ownership of Assets

1. All equipment purchased by MUR for use in the Italian scientific program under this Project Annex shall be the property of the Government of the Italian Republic or a MUR collaborating institution in Italy.
2. Notwithstanding Section 8 of the Implementing Arrangement, unless otherwise mutually agreed by the Parties in writing, the Parties agree that all DOE-owned equipment sent to MUR by DOE as a part of their collaboration

under this Project Annex shall become the property of, and title shall pass to the Government of the Italian Republic in the event and at the time MUR or its designated collaborating institution in Italy provides written confirmation that it has met the acceptance criteria specified in project planning documents and/or other written instruments as identified in paragraph F.6 of this Section.

3. Notwithstanding Section 8 of the Implementing Arrangement, unless otherwise mutually agreed by the Parties in writing, the Parties agree that all MUR-owned equipment sent to DOE by MUR as a part of their collaboration under this Project Annex shall become the property of, and title shall pass to, the United States Government in the event and at the time DOE provides written confirmation that it has met the acceptance criteria specified in project planning documents and/or other written instruments as identified in paragraph F.6 of this Section.

D. Intellectual Property

1. Except as provided in paragraph D.2, the protection and allocation of intellectual property, and the treatment of business-confidential information, shall be governed by the provisions of Section 11 of the Implementing Arrangement and Annex I (Intellectual Property) to the S&T Agreement.
2. The Parties may share or transfer jointly-owned intellectual property outside the territories of their respective countries only if, and to the extent, authorized by applicable export control requirements of the exporting Party's country.

E. Professional Training

The Parties plan to explore the need to train their respective professionals in the technologies listed in Section 2.

F. Contributions from the Parties

1. The Parties intend to cooperate on leading scientific knowledge, attendance in relevant meetings, program reviews, and site visits, as necessary, and make in-kind contributions to each other's scientific programs, in the areas described in Section 2.
2. DOE, by way of Fermilab, and INFN shall each provide contributions to the research, development, and associated applications of advanced computing techniques as described in Section 2.B.1. Such contributions shall include

support for any personnel undertaking the work, it being understood that each Participant is responsible for the payment of salaries, insurance, and allowances to its respective personnel.

3. Details regarding the cooperative activities on quantum information science and technology as described in Section 2.B.2, including the value of the associated in-kind contributions, are specified in a separate procurement-related written instrument titled "Research Agreement concerning National Quantum Information Science Research Centers" for the project titled "Superconducting Quantum Materials and Systems," Research Subaward Number 674771, between the Fermi Research Alliance, LLC, as the manager and operator of Fermilab, and INFN, signed on March 4, 2021.
4. To enable and support cooperative activities and contributions described in Sections 2.B, 4.F.2 and 4.F.3, the Participants are expected to follow all applicable environmental, safety, and health standards, and cybersecurity rules and regulations at each facility where work is performed.
5. The itemized list and schedule of deliverables from both Parties shall be decided and agreed to by the Technical Coordinators.
6. Additional information on planned scope of work, itemized list of deliverables, or other intended research and development, or cooperative activities to be performed under this Project Annex may be exchanged and memorialized by and between the Parties and/or their Participants through non-binding written instruments such as project planning documents, letters of intent, or memoranda of understanding. Such instruments may cover, but are not limited to, requirements and specifications of equipment, performance and/or personnel to be exchanged, definition of task responsibilities within a specific area of the program, schedules and milestones, program review processes, coordination, contributions, applicable standards for safety, rules and regulations for computing and cybersecurity, and adjustments of organizational structure as needed.
7. The Parties may consider making subsequent plans of further in-kind contributions to the program identified under this Project Annex, which shall be documented in subsequent Project Annexes pursuant to Section 4 of the Implementing Arrangement, or in amendments to this Project Annex in accordance with Section 6.B.

Section 5 – Management


- A. The Technical Coordinators designated pursuant to Section 5 of the Implementing Arrangement shall jointly plan the technical approach for accomplishing the objective of this Project Annex, and shall be responsible for the collaborative program, schedule, and coordination. The Technical Coordinators shall also make progress reports at management meetings to be held at mutually agreed sites, preferably annually.
- B. Each Party shall exercise due care of budget, schedule, safety, and other applicable requirements in carrying out all the work under this Project Annex.

Section 6 – Entry into Force, Amendment, and Termination

- A. This Project Annex shall enter into force upon signature by the Parties and remain in force so long as the Implementing Arrangement remains in force.
- B. This Project Annex may be amended by mutual written agreement of the Parties, so long as the Implementing Arrangement remains in force.
- C. The Parties may terminate this Project Annex at any time by mutual written agreement. Alternatively, either Party may terminate this Project Annex upon six (6) months advance notice in writing to the other Party.

DONE at Washington, this 9th day of April 2024, in duplicate, in the English language.

**FOR THE MINISTRY OF
UNIVERSITIES AND RESEARCH
OF THE ITALIAN REPUBLIC:**



Anna Maria Bernini

Minister of Universities and Research

**FOR THE DEPARTMENT OF
ENERGY OF THE
UNITED STATES OF AMERICA:**



Harriet Kung

Acting Director
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