**Annex 3.**

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

**APPROVED**

**JINR DIRECTOR**

**_____ /_____**

**"____" _____ 202 г.**

## PROJECT PROPOSAL FORM

Opening of subproject "Development of low-temperature detection systems for the study of coherent elastic neutrino scattering on atoms and nuclei and measurement of electromagnetic characteristics of neutrinos" (subproject NUCLEAR BOLOMETER) of the large research infrastructure project "Study of coherent elastic neutrino scattering on atoms and nuclei and measurement of electromagnetic characteristics of neutrinos using an intense tritium antineutrino source (Project SATURNE: Sarov-tritium-neutrino-experiment, САТУРН) within the Topical plan of JINR "Non-accelerating neutrino physics and astrophysics"

**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) - *the theme code includes the opening date, the closing date is not given, as it is determined by the completion dates of the projects in the topic.*

**1.2 Project/LRIP subproject code** (for extended projects)

**1.3 Laboratory of nuclear problems**

**1.4 "Non-accelerating neutrino physics and astrophysics"**

**1.5 NUCLEAR BOLOMETER**

**1.6 Trofimov V.N.**

**1.7**

**2 Scientific case and project organization**

**2.1 The aim of the NUCLEAR BOLOMETER subproject is to produce prototypes of helium and silicon low-temperature detectors based on the "dry" type refrigerator of He3 dilution in He4 and to study various methods of generation and detection of elementary excitation pulses in superfluid helium, as well as to study the mode of "thermal" amplification in the silicon detector at conversion of ionization into heat.**

**2.2 The NUCLEAR BOLOMETER subproject is a continuation of the work on the application of ultra-low temperatures in nuclear physics, started in the mid-60s of the last century in the Laboratory of Nuclear Problems under the leadership of B.S. Neganov with the world's first successful realization of the method of obtaining continuous ultra-low temperature by**

**dissolving He3 in He4. The first application was the development and use of polarized nuclear targets of "frozen" type on accelerating beams. After successful mastering of this technique in the late 70's, almost simultaneously and independently in JINR and CERN the concept of using low-temperature bolometers for registration of rare events, including those involving neutrinos, was proposed. To date, this has developed into a powerful and rapidly developing direction in experimental nuclear physics, whose priority tasks are the detection of "dark" matter particles such as WIMP and processes involving neutrinos (in particular, neutrino-free double beta decay).**

**2.3 2024-2029**

**2.4 Laborary of nuclear problems**

### 2.4.1 MICC resource requirements

| Computing resources | Distribution by year | | | | |
|---|---|---|---|---|---|
| | 1st year | 2nd year | 3rd year | 4th year | 5th year |
| Data storage (TB)<br>- EOS<br>- Tapes | | | | | |
| Tier 1 (CPU core hours) | | | | | |
| Tier 2 (CPU core hours) | | | | | |
| SC Govorun (CPU core hours)<br>- CPU<br>- GPU | | | | | |
| Clouds (CPU cores) | | | | | |

### 2.5. Participating countries, scientific and educational organizations

| Organization | Country | City | Participants | Type of agreement |
|---|---|---|---|---|
| **Russian Federal Nuclear Center** | **Russia** | **Sarov** | **Yukhimchuk A.A. +10** | |
| **Joint institute for nuclear research** | **Russia** | **Dubna** | **Trofimov V.N. + 6** | |
| **Lomonosov Moscow State University** | **Russia** | **Moscow** | **Studenikin A.A. Kouzakov K.A. + 4** | |
| **R.E. Alekseev Nizhny Novgorod State Technical University** | **Russia** | **Nizhny Novgorod** | **Pankratov A.L. Gordeeva A.V. + 5** | |
| **Institute of Physics of Microstructures** | **Russia** | **Nizhny Novgorod** | **Melnikov A.S. + 2** | |
| **Institute for Nuclear Research RAS** | **Russia** | **Troisk** | **Tkacev I.I. Ivashkin A.P. + 3** | |
| **Physico-Technical Institute named after A.F.Yoffe** | **Russia** | **Sankt-Peterburg** | **Eremin V.K. + 2** | |

| | | | | |
|---|---|---|---|---|
| **Production Association "Mayak"** | **Russia** | **Ozersk** | | |

**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** | **Category of personnel** | **JINR staff, amount of FTE** | **JINR Associated Personnel, amount of FTE** |
|---|---|---|---|
| 1. | research scientists | 3 | |
| 2. | engineers | 2 | |
| 3. | specialists | ~~2~~ | |
| 4. | office workers | ~~1~~ | |
| 5. | technicians | ~~1~~ | |
| | **Total:** | **9** | |

**3.2. Available manpower**
**3.2.1. JINR staff**

| No. | Category of personnel | Full name | Division | Position | Amount of FTE |
|---|---|---|---|---|---|
| 1. | research scientists | | | | |
| 2. | engineers | | | | |
| 3. | specialists | | | | |
| 4. | technicians | | | | |
| | **Total:** | | | | |

**3.2.2. JINR associated personnel**

| No. | Category of personnel | Partner organization | Amount of FTE |
|---|---|---|---|
| 1. | research scientists | | |
| 2. | engineers | | |
| 3. | specialists | | |
| 4. | technicians | | |
| | **Total:** | | |

**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.

**4.2 Extra funding sources**
Expected funding from partners/customers – a total estimate.

**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**

| **Expenditures, resources, funding sources** | | | **Cost (thousands of US dollars)/ Resource requirements** | **Cost/Resources, distribution by years** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1st year | 2nd year | 3rd year | 4th year | 5th year |
| | | International cooperation | | | | | | |
| | | Materials | | 20 | 10 | 28 | 28 | 28 |
| | | Equipment, Third-party company services | | 10 | | | | |
| | | Commissioning | | | | | | |
| | | R&D contracts with other research organizations | | | 20 | | | |
| | | Software purchasing | | | | | | |
| | | Design/construction | | | | | | |
| | | Service costs (*planned in case of direct project affiliation)* | | | | 2 | 2 | 2 |
| **Resources required** | **Standard hours** | Resources | | | | | | |
| | | – the amount of FTE, | | | | | | |
| | | – accelerator/installation, | | | | | | |
| | | – reactor,… | | | | | | |
| **Sources of funding** | **JINR Budget** | JINR budget *(budget items)* | | | | | | |
| | **Extra fudning (supplementary estimates)** | Contributions by partners<br>Funds under contracts with customers<br>Other sources of funding | | | | | | |

_____/_Trofimov V.N./

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<br>THEME / LRIP LEADER | _____ SIGNATURE | _____ NAME | _____ DATE |
| PROJECT / LRIP SUBPROJECT LEADER | _____ SIGNATURE | _____ NAME | _____ DATE |

APPROVED BY THE PAC

_____ SIGNATURE _____ NAME _____ DATE

**Annex 4.**

***Project (LRIP subproject) report form***

# PROJECT REPORT

**1. General information on the project / LRIP subproject**
**1.1. Scientific field**

**1.2. Title of the project / LRIP subproject**

**1.3. Project (LRIP subproject) code**
***Example (04-4-1140-1-2024/2027)***

**1.4. Theme / LRIP code**
***Example (theme 04-4-1140-2024,* MIP *04-4-1140-2024)***

**1.5. Actual duration of the project/ LRIP subproject**

**1.6. Project / LRIP subproject Leader(s)**

**2. Scientific report**

**2.1. Annotation**

**2.2. A detailed scientific report**
2.2.1. Description of the mode of operation and functioning of the main systems and equipment (for the LRIP subproject).
2.2.2. A description of the conducted experiments (for experimental projects).
2.2.3. A description of the research undertaken and the results obtained.
2.2.4. A list of the main publications of the JINR authors, including associated personnel on the results of the project (list of bibliographical references).
2.2.5. A complete list of publications (electronic annex, for journal publications with journal impact factor).
2.2.6 List of talks given at international conferences and meetings (electronic annex).
2.2.7. Patent activity (if any)

**2.3. Status and stage (TDR, CDR, ongoing project) of the project (subproject) (including percentage of implementation of the declared milestones of the project (LRIP subproject)** *(if applicable)*

**2.4. Results of related activities**
2.4.1. Research and education activities. List of defended dissertations.
2.4.2. JINR grants (scholarships) received.
2.4.3. Awards and prizes.
2.4.4. Other results (expert investigation, organizational, outreach activities).

**3. International cooperation**

Actually participating countries, institutions and organizations

| Organization | Country | City | Participants | Type of agreement |
|---|---|---|---|---|
| | | | | |
| | | | | |

**4. Analysis of planed vs actually used resources: manpower (including associated personnel), financial, IT, infrastructure**

**4.1 Manpower** (actual at the time of reporting)

| No. | Personnel category | JINR staff, amount of FTE | JINR associated personnel, amount of FTE |
|---|---|---|---|
| 1. | research scientists | | |
| 2. | engineers | | |
| 3. | specialists | | |
| | **Total:** | | |

**4.2 The actual estimated cost of the project/ LRIP subproject**

| Names of costs, resources, funding sources | | Cost (thousands 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 | | | | | | |
| | Materials | | | | | | |
| | Equipment, Third-party company services | | | | | | |
| | Commissioning | | | | | | |
| | R&D contracts with other research organizations | | | | | | |
| | Software purchasing | | | | | | |
| | Design/construction | | | | | | |
| | Service costs (*planned in case of direct project affiliation)* | | | | | | |
| **Resources required Standard hours** | Resources | | | | | | |
| | – the amount of FTE, | | | | | | |
| | – accelerator/installation, | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | – reactor,… | | | | | | |
| **Sources of funding** | **JINR Budget** | JINR budget *(budget items)* | | | | | | |
| | **Extra fudning (supplementary estimates)** | Contributions by partners<br>Funds under contracts with customers<br>Other sources of funding | | | | | | |

**4.3 Other resources**

| **Computer resources consumed MICC** | **Distribution by years** | | | | |
|---|---|---|---|---|---|
| | **1st year** | **2nd year** | **3rd year** | **4th year** | **5th year** |
| Data storage (TB)<br>- EOS<br>- Tapes | | | | | |
| Tier 1 (CPU core hours) | | | | | |
| Tier 2 (CPU core hours) | | | | | |
| SC Govorun (CPU core hours)<br>- CPU<br>- GPU | | | | | |
| Clouds (CPU cores) | | | | | |

**5. Conclusion**

**6. Proposed reviewers**

**Theme / LRIP Leader**

**_____/_____/**
**"_____"_____ 202_г.**

**Project leader (project code) / LRIP subproject**
**_____/____/**
**"_____"_____ 202_г.**

**Laboratory Economist**
**_____/_____/**
**"_____"_____ 202_ г.**