**The name of the Project/subproject of the LRIP:** Development of a particle registration technique in future experiments with the participation of JINR

The name shows that the project will accumulate all experts in particle registration methods of JINR.

The list of JINR core staff consists of 32 people, most of them are from DLNP, 1 a Head of sector from FLNP, 2 heads of sector, 1 head of group and 1 head of service from VBLHEP. All participants from non-DLNP have 0.1 FTE. From this I see that real participants are from DLNP and project involves a part of detector experts of JINR only. Also, I am not sure that all detector experts from DLNP are involved in this project.

Note: the project was considered by STC of DLNP only.

**2 Scientific rationale and organisational structure**

**2.1 Annotation.**

“The project proposes to combine efforts in different directions in order to effectively use human and material resources.” I did not find any explanation how the efficiency will use human and materials resources be ensured. I only see that many different projects will be done by “one” team, and the team from 32 people is the project collection point.

**2.2 Scientific justification**

*Purpose of the project*

“The goals set in the project are aimed at solving problems arising in future collider experiments at the Super c-tau factory (SCT) in Russia, at the Super tau-charm facility (STCF) and the Circular Electron Positron Collider (CEPC) in China, and at accelerators with fixed targets at intermediate and high energies, as well as in the search experiments Mu2e-II, Comet (phase 2).”

I suppose that many teams participating in these project are working on detectors. You need to show the demand for your activities from these projects.

“One of the goals of the project is also to train qualified personnel. Bachelors, masters, and graduate students will participate in the project and will use the results obtained in their dissertations.” This is an absolutely correct intention, and the project has quite a lot of activities for students, young scientists, engineers and technicians.

*Relevance and scientific novelty*

The task of searching for new materials, developing promising detectors and methods for detecting particles, and developing new methods of data analysis is not controversial.

*Methods and approaches, methodologies*

1. Development of microstructure and straw gas detectors.

This part of the project is very reasonable. JINR is a leader in sraw detectors. A discription of development straw production facilities and detectors based on well-type gas electron multipliers with a resistive anode (WEM) production facility and budget for this is not in the proposal and it is a weak place.

“ It is planned to develop technology for the production of microstructured gas detectors designed to operate under high beam rate. Gas detectors with parameters (gas gain greater than 20,000, energy resolution up to 20%, spatial resolution up to 200 μm) comparable to the best existing analogues with the possibility of production on the basis of DLNP JINR will be developed and created.” How does the energy resolution term apply to these detectors?

1. Development, production and testing of prototypes of electromagnetic calorimeters.

This reseach line is a mixure of 2 topics. "A high degree of granularity in the transverse and longitudinal directions” is the main idea, illustrated with Crilin (A CRystal calorImeter with Longitudinal InformatioN for a future Muon Collider ) project discription (a semi-homogeneous crystal calorimeter with longitudinal information ). Crilin group works on a calorimeter with good energy resolution (less than 10%/ 𝐸) for jet detection with 𝑝 (jet) in range from 5 GeV to 250 GeV at a muon collider.

But then the proposal says “We plan to conduct studies of prototype longitudinally segmented electromagnetic calorimeters using LYSO and other crystals to determine time and energy resolution. Research will be carried out using electron beams (Linac-200 at JINR and other centers). Such studies may be of interest to future experiments planned at Linac-200, as well as experiments at future colliders.” It means that the team is going to make a calorimeter for electron, positron and gamma registration in range from 100 KeV to 200 MeV. I don’t understand why Crilin detectors was taken as a prototype, but detector (calorimeter) for 100 KeV-200 MeV energies (with 3-4% resolution at 511 KeV) is a good project and could be used at Linac-200 and at experiments at NICA.

1. Radiation resistance of materials and electronics

“We plan to continue studying the radiation resistance of pure and yttrium-doped BaF2 crystals, LYSO crystals, and others of interest.” Many groups work in the same direction. The Caltech/JPL/FBK collaboration is one of the best (David Hitlin, Caltech, CPAD Instrumentation Frontier Workshop March 18, 2021). How does the activity you are planning compare to the work of this collaboration?

IV. New scintillation materials for detecting thermal neutrons

“The goal of these works is to create new scintillation materials with high neutron conversion efficiency, low gamma sensitivity and high transparency.” This research line is very important but how do these activities relate to the project's goals?

V. Optimizing the operation of scintillation detector systems

This research line is directed to the future Mu2e-II and Comet (phase 2). Options of muon system with scintillation strips with signals readout using WLS fibers and SiPMs will be studied.

The “scintillator+SiPM+front-end” system with the goal of minimizing response time (increasing detector speed) and achieving a time resolution of 50 ps will be studied as well (most probably for the SPD).

I suppose that many group do the same studies in JINR. May be a collaborative work should be organizad.

VI. Development and application of Monte Carlo methods for modelling prototypes of electromagnetic and hadronic calorimeters.

Within the framework of the proposed project, it is planned to perform tasks for modelling, studying the properties, and optimizing electromagnetic and hadronic calorimeters that will arise during the development of calorimeters in experiments at SCT, STCF, and CEPC.

There is not any request for computing resources. This activity should be done with detector test with high energy test beam. Where are you going to do this?

Shanghai Institute of Ceramics (SIC) and analog facilities in Russia