

## STUDY OF THE MECHANISMS OF HADRON-NUCLEAR INTERACTIONS ON THE POSITIVE BEAM LINE 18 OF U-70 ACCELERATOR (Experiment proposal)

Friday, 15 July 2022 12:10 (20 minutes)

The aim of the project is to study the mechanisms of hadron-nuclear interactions at the Hyperon experimental setup located on beam line 18 of the U-70 accelerator complex, Protvino. It is proposed to upgrade the setup so that to be able to study additionally the excited states of secondary nuclei by means of precision nuclear gamma-ray spectroscopy in dependence on the specific type of interaction of hadrons with target nuclei. Of particular interest is the newly discovered  $d(2370)$  dibarionic state formed both in vacuum and in the composition of light nuclei, where it can presumably replace deuteron clusters. Precision gamma-ray spectroscopy makes it possible to differentiate these cases. Further detailed study of these phenomena is necessary. It opens up a new direction in nuclear physics at the junction with the particle physics of intermediate energies.

The project will be carried out on the basis of the existing Hyperon-M experimental setup of NRC "Kurchatov Institute" - IHEP. The main detector of the setup is the cherenkov lead glass photon spectrometer LGD2 used for detection of energetic photons in the forward hemisphere of reaction  $\pi+A \rightarrow M\gamma A'$ . To fulfill the tasks of the new project, it is proposed to upgrade the setup with the Charged Particle Veto (CPV) and Gamma Nuclear Transition (GNT) detectors. The CPV detector is a system of segmented scintillation counters dedicated for detection of the secondary charged particles in a solid angle close to  $4\pi$ . For detection of the scintillation light the SiPM type photodetector will be used. The GNT detector is dedicated for precision measurement of photon energies in nuclear gamma-transitions of secondary nuclei formed as a result of the interaction of beam particles with target nuclei. The energy spectrum of these photons lies in the range from 0.25 to 80 MeV.

After the gradual modernization of the setup to the Hyperon+ level, it is planned to expose the setup on the positive beam line with the momentum of 7 GeV/c for several nuclear targets (Li, Be, B, C, O) and obtain experimental data for a detailed analysis of  $2\pi 0$  systems formed, among other things, as a result of the decay of  $d(2370) \rightarrow d+2\pi 0$  both in vacuum and inside the target nucleus.

### The speaker is a student or young scientist

No

### Section

1. Experimental and theoretical studies of nuclear reactions

**Primary author:** SADOVSKY, Serguei (NRC "Kurchatov institute" - IHEP)

**Presenter:** SADOVSKY, Serguei (NRC "Kurchatov institute" - IHEP)

**Session Classification:** Experimental and theoretical studies of nuclear reactions