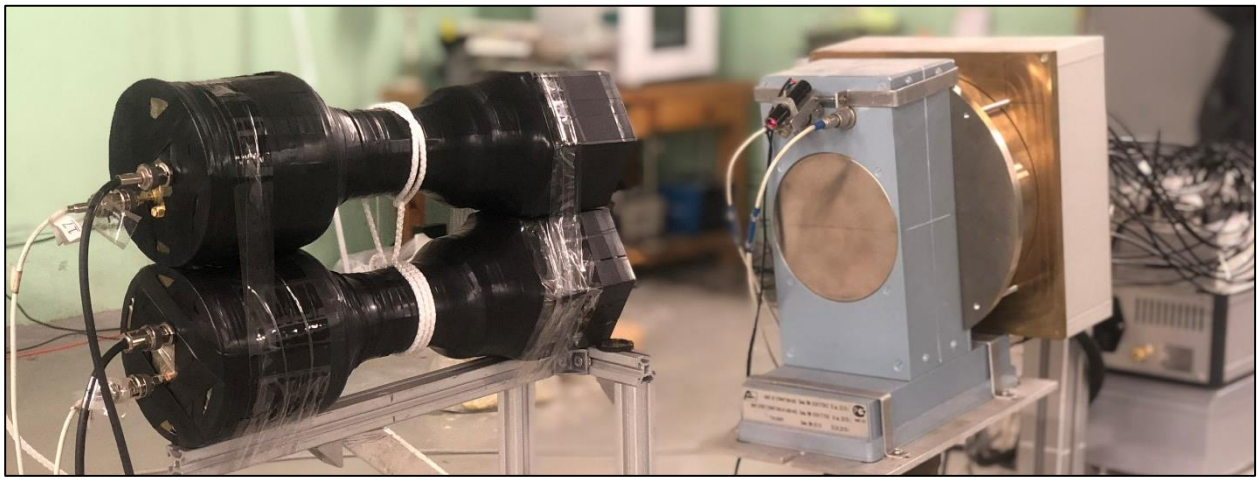
Calibration and Characterization of a CsI Scintillator Detector with Gamma Sources

Laboratory and group:

JINR Flerov Laboratory of Nuclear Reactions, Sector 6.

Supervisors:
Phan Nguyen Hoang Long.

Overview:
In preparation for upcoming experiments involving exotic light nuclei with radioactive ion beams (RIBs), precise calibration and handling of gamma detectors is essential. This summer student project offers a hands-on introduction to scintillator-based gamma detection, focusing on the setup, operation, and calibration of a 1”×1” CsI (Tl) scintillation detector.



Objectives:

- Learn to set up and operate a CsI scintillation detector.
- Gain practical experience using standard gamma sources for detector calibration.
- Understand and apply basic procedures for radiation safety.
- Set up a basic data acquisition (DAQ) chain for gamma spectroscopy.
- Acquire and analyze calibration spectra using CERN ROOT.

Key Activities:

- Setting up a measurement with gamma sources such as Cs-137 and Co-60.
- Recording and visualizing spectra using DAQ software.
- Analyzing peak positions and resolutions using ROOT.

- Perform energy calibration and acquire the energy resolution curve for the CsI scintillator.

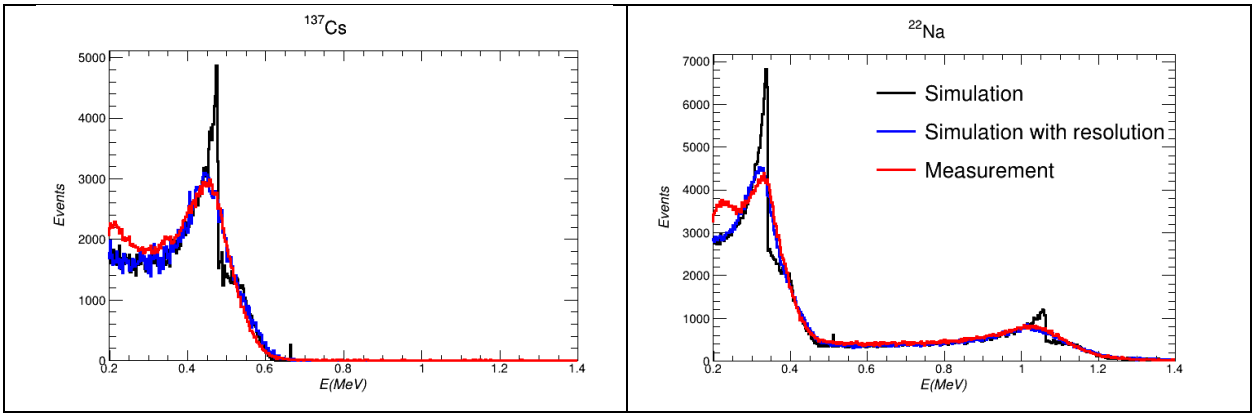
Expected Outcomes:

- Practical knowledge of gamma spectroscopy techniques.
- Familiarity with CsI detector characteristics (light output, resolution, timing).
- Experience with data acquisition and analysis tools used in nuclear physics.
- Preparation for future involvement in full-scale detector systems.

Duration:
2–3 weeks (June–July 2025)

Requirements:

- Basic understanding of how radiation interacts with matter.
- Willingness to learn about scintillation detectors and safety protocols.
- Introductory programming skills in C++.
- Some familiarity with CERN ROOT (or readiness to learn during the project).



Notes:
This practice is part of the broader effort to prepare detection systems for studies of exotic nuclei at facilities such as ACCULINNA-2. It is well-suited for students new to experimental nuclear physics who wish to gain foundational laboratory experience. The project can be organized for 1-2 student(s).

Literature for preparation:

W. R. Leo, Techniques for Nuclear and Particle Physics Experiments.