

Beamtime Proposal IFIN-HH PAC OCT 2017

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Beamtime requested: 8 days, Period: 12-20 April, 2018

Accelerator: 3 MV Tandetron.

Beam: ^{13}C , Energy: 4.6 – 9.0 MeV, Intensity: 10 μA or maximum.

Proposal title: Training school for COST Action ChETEC (Chemical Elements as Tracers of the Evolution of Cosmos)

We are part of the above named COST Action, which has as main object the increase of collaboration between nuclear physicists, astrophysicists, astronomers, cosmochemists, etc.

One type of actions are training schools, aimed at PhD students and post-docs from COST countries.

We have proposed a **training school at IFIN-HH:**

„An experiment of Nuclear Physics for Astrophysics using direct methods"

and it was approved for the period April 10-20, 2018. The proposal for the training school was approved by the MC of ChETEC, and is being financed fully. It is described in the attached document. The period is fixed, the beam and energy also (but we may change them according to needs).

The number of trainee aimed at is 15 from outside + 3(5) from Romania (IFIN-HH) = 18(20).

The number of trainers: 3 from outside + 2(3) from IFIN-HH = 5(6).

We plan to have lectures in the first 3 days of the event, followed by experiments at the accelerator. The students will be split into 3 groups that will work independently at the accelerator and at the ultra-low background laboratory in the Slanic salt mine. Prompt and activation gamma measurements will be done.

The program envisions also visits in IFIN-HH, demonstrations in the target laboratory of Department of Nuclear Physics (DFN) and a one day training on the calibration of ROSPHERE detectors array.

The equipment for the tandetron experiment will be provided by the Nuclear Astrophysics Group (NAG), who will also assist during the period.

The guest trainers will be:

Prof. Marialuisa Aliotta, Univ. of Edinburgh – Introduction to Nuclear Astrophysics

Dr. Gyorgy Gyurky (ATOMKI Debrecen) – Experimental methods in NA: direct measurements

Prof. Sylvia Leoni (Univ Milano, TBC) – Gamma-ray spectroscopy in NA

The detailed schedule of the training school may be found in the following pages.

"An experiment of Nuclear Physics for Astrophysics using direct methods"

Bucharest-Magurele, Apr. 10-20, 2018

IFIN-HH of Bucharest-Magurele, Romania will host a training school in nuclear astrophysics of a 11 days duration, consisting in classes and hands-on activities:

1. In a target laboratory
2. Manning an experiment at the 3 MV tandetron (7 days around the clock)
3. Prompt gamma-ray measurements at 9 MV tandem and the ROSPHERE array
4. De-activation measurements in an underground laboratory we have in a salt mine.

Local and invited trainers will lead the participants during the school that will cover most types of activities a physicist engaged in nuclear physics for astrophysics, in particular those engaged in direct measurements for nuclear astrophysics, will have to go through.

The intended level is PhD student and early post-doc.

The trainees:

- a. will attend introductory classes
- b. will man the experiment round the clock,
- c. will make the experimental arrangement,
- d. will handle the DAQ system,
- e. will collect and
- f. will analyze on/offline data (prompt and de-activation gamma-rays).

The activities would fit best with WG1 of CA 16117 ChETEC.

Program

We propose to split into 3 groups of 5 students each, who will do independent study and work, in parallel, mostly on same or similar tasks

Classes will be together, at the beginning

April 10, 11, 12: Classes and visits to IFIN-HH infrastructure: Accelerators, Dep of Hadron Physics, IRASM (industrial size gamma-ray irradiator; ELI-NP

- mornings 9-12: 3 lectures x 1 hr
- lunch 12:30 - 14
- afternoons: 14 – 17
 - o target laboratory (group 1, 2, 3)
 - o or calibration of Ge detectors (energy and efficiency) for prompt gamma-ray measurement
 - o or ROSPHERE gain match and calibrations

April 12 – Start setup of experiment at 3 MV Tandetron™

Detectors and DAQ

April 13-19 – Experiments at the tandemron:

- 1 day (24 hrs) – Irradiation of targets; prompt gammas and activation
 - 1 day – drive to the ultra-low background lab in salt mine; activation measurements
 - 1 day – data analysis and new irradiation + beta-gamma coincidences locally
- Repeat cycle with each group, then drop the energy and measure again

(groups will work on Sat – Sun, April 14-15!)

April 19, afternoon - Comparison of results of the three independent groups (I)

April 20 – Comparison of results of the three independent groups (II)

- departures

All interspersed with other lectures.