ISOLPHARM CORE

INFN Istituto Nazionale di Fisica Nucleare LABORATORI NAZIONALI DI LEGNARO

SPES MED

Laboratori Nazionali di Legnaro – INFN

Hands-on Workshop on IRIS Control Software

Introduction to the ISOLPHARM Radionuclide Implantation Station (IRIS)

D. Serafini and A. Leso

September 17th, 2025

Today outline

10:00 → 10:05 **Welcome** — 5m — Sala Rostagni

Relatori: Alberto Andrighetto (Istituto Nazionale di Fisica Nucleare), Emilio Mariotti (Istituto Nazionale di Fisica Nucleare)

10:05 → 10:25 **Introduction to the ISOLPHARM Radionuclide Implantation Station (IRIS)** — 20m — Sala Rostagni

Relatori: Aurora Leso (Istituto Nazionale di Fisica Nucleare), Davide Serafini (University of Siena & INFN-LNL)

10:25 → 11:00 **The IRIS fancy GUI** — 35m — Sala Rostagni

The target of this presentation are beginners, so the pace will be slow and every step will be explained. Feel free to ask questions during the presentation.

Relatori: Daiyuan Chen (Istituto Nazionale di Fisica Nucleare), Massimo Giuseppe Martello (INFN-LNL)

11:00 → 11:20 **Coffee break** — 20m — Sala Rostagni

11:20 → 12:20 **IRIS hands-on at SPES** — 1h — SPES

Volunteers will operate IRIS to perform *collection + measurement* cycles at SPES.

12:30 → 14:00 **Lunch break** — 1h 30m — Canteen

14:00 → 15:00 **IRIS hands-on at SPES** — 1h — SPES

Volunteers will operate IRIS to perform *collection + measurement* cycles at SPES.

15:00 → 15:40 **Debriefing** — 40m — Sala Rostagni

Discussion starting from the presentation of the known open issues and from the feedbacks from the audience.

Outline

- Introduction
- IRIS at SPES
- Conceptual workflow
- Detector focus

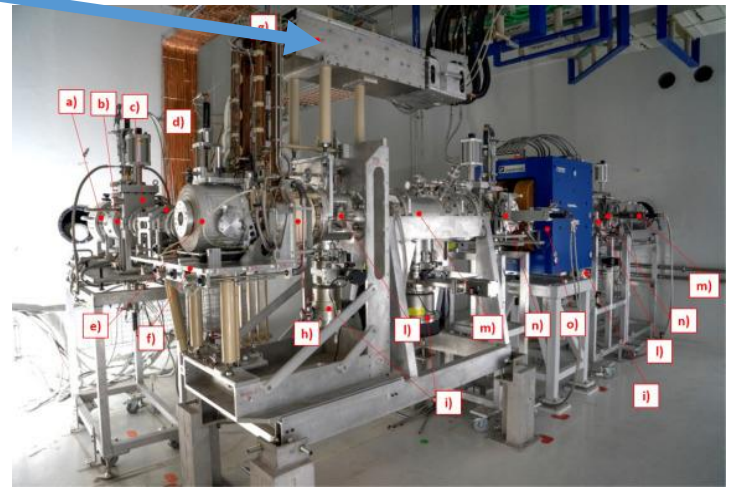
Radionuclide production for Internal Radiotherapy

Production techniques

- ISOL
- Nuclear reactor
- Cyclotron

SPES cyclotron

LENA reactor

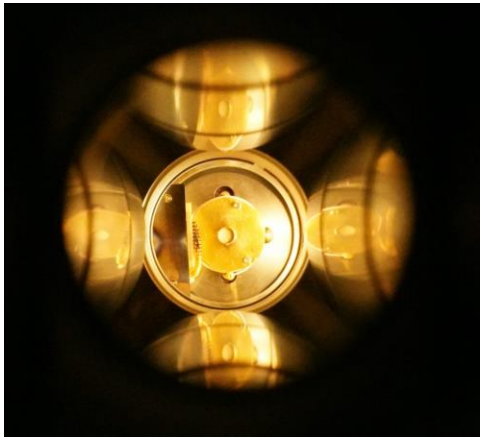


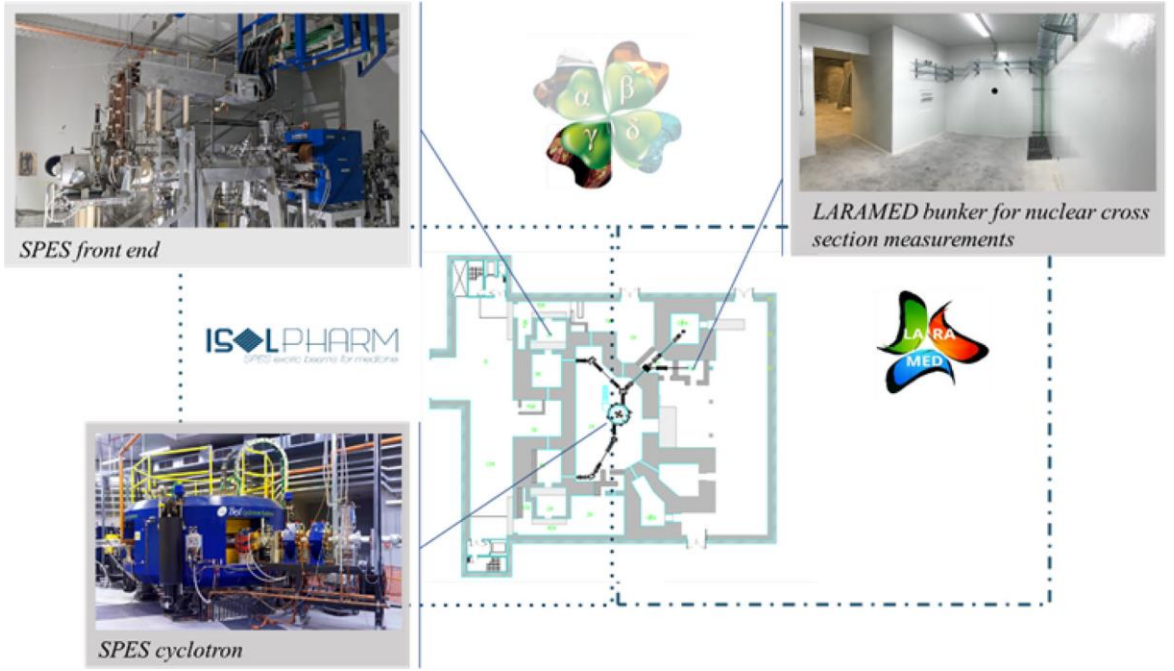
SPES ISOL bunker

SPES γ

Radioisotope Service for Medicine and Applied Physics (RMFA):

- LARAMED -> cyclotron
- ISOLPHARM -> ISOL

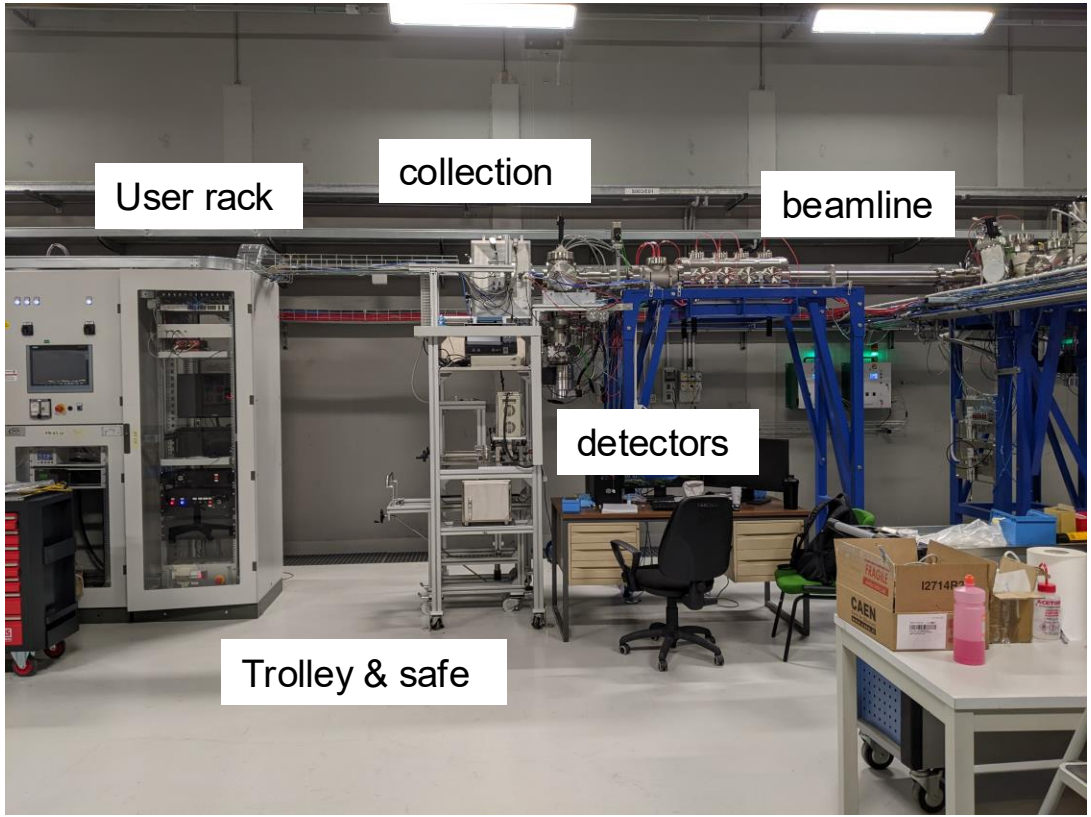




IRIS is in S003, beamline at 0°

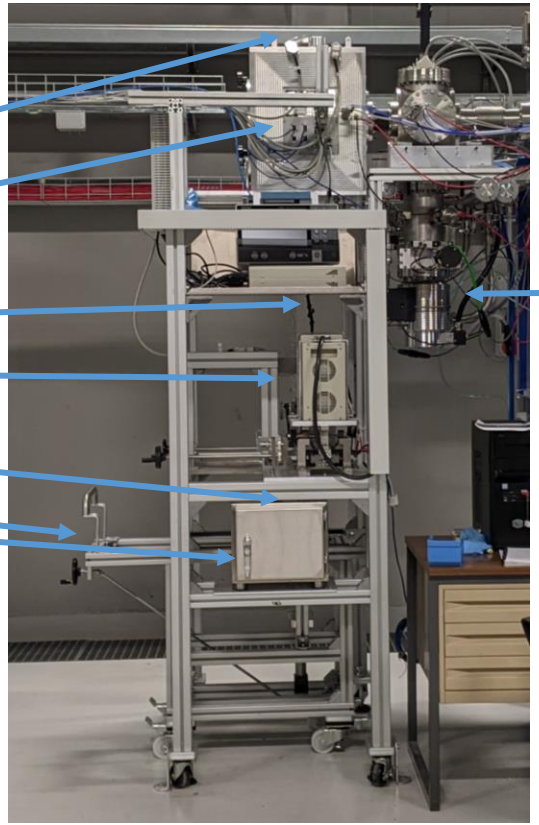
IRIS

- Updated pic of the beamline



IRIS collection and detection

- Top loading slider
- Irradiation site
- Bottom unloading slider
- Detectors
- Vial
- Trolley
- Lead safe

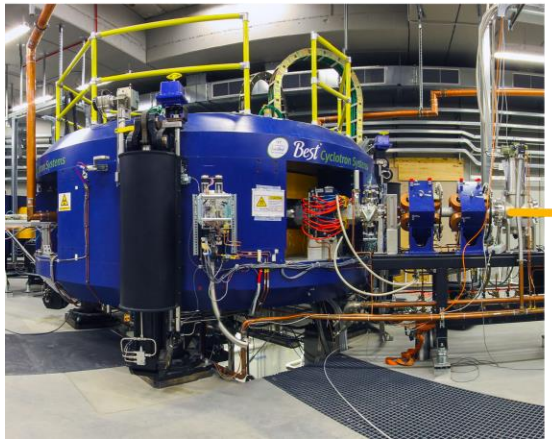


- Beamline
- Vacuum pump

IRIS user rack

- Optical switch
- Network switch
- Detectors signals panel
- Digitizers and HV module
- Computer
- LED box
- Motors box
- MPS box

Physics example: Na-24



SPES cyclotron

Ip = 1 μA

Ip = 6e12 p/s

ISOL radionuclide production

Ip = 4e5 n/s

In = 6e-8 n/p

ε = 70 %

ionization

R I B

ε = 100 %

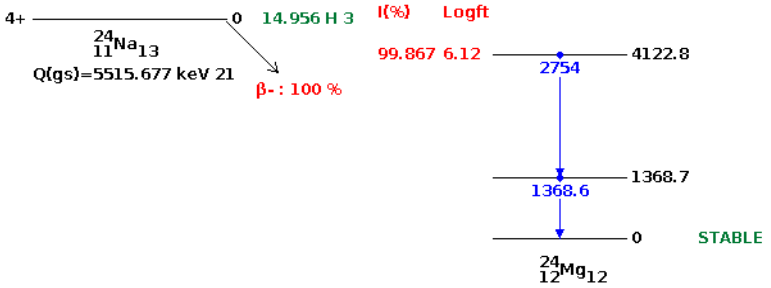
^{111}Cd ^{111}Ag

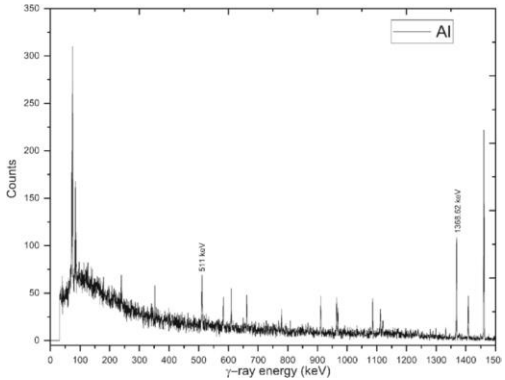
Mass separation

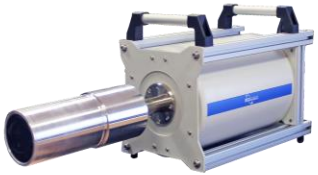
ε = 90 %

IRIS collection

Physics example: Na-24







εdet = 2e-4

What is IRIS useful for?

IRIS can:

- collect radionuclides
- Measure their activity

Putting together the information from the proton beam, it is possible to:

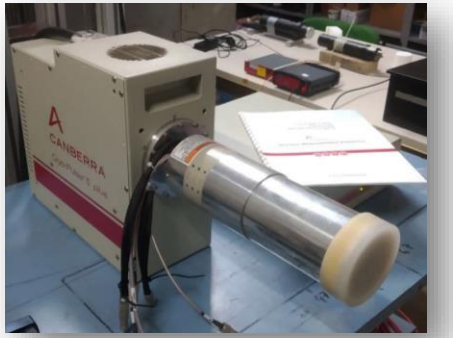
- estimate the yield of production

Or, assuming the calculations for the yield:

- Estimate the efficiency

Instruments

- **HPGe** detector

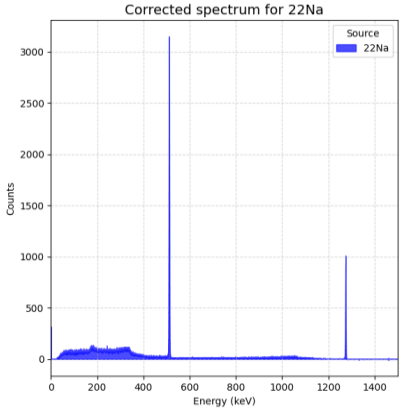


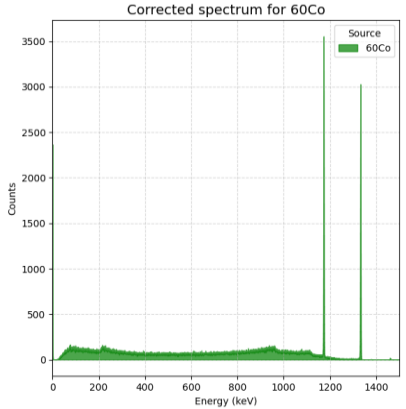
- **LBC** detector

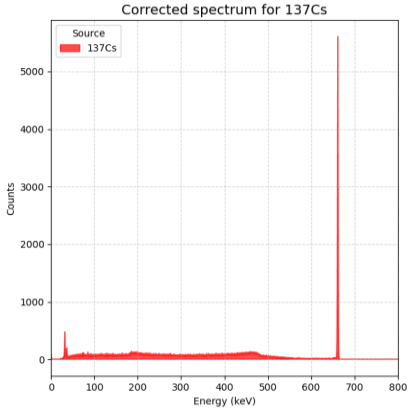
GOAL

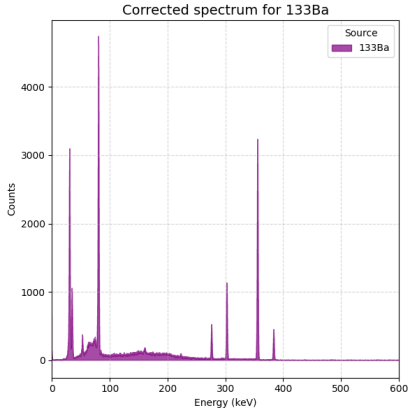
Having the **two detectors acquiring a gamma source at the same time** yet not in coincidence

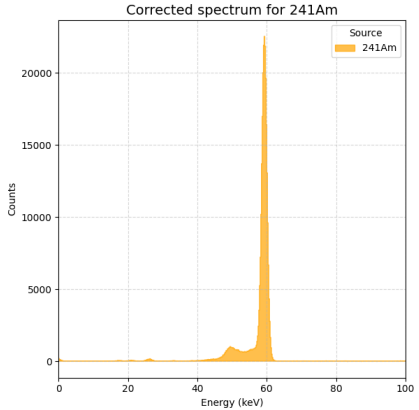
The HPGe spectra ☺



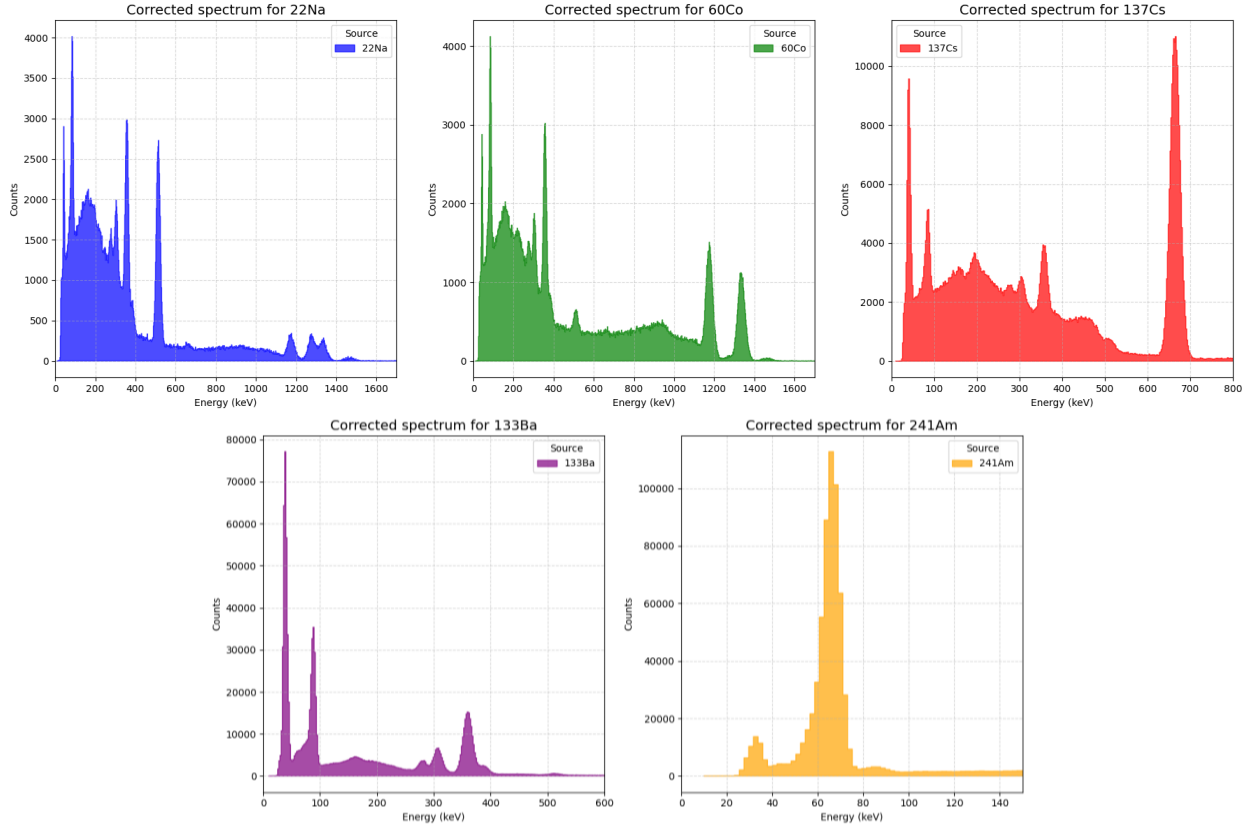






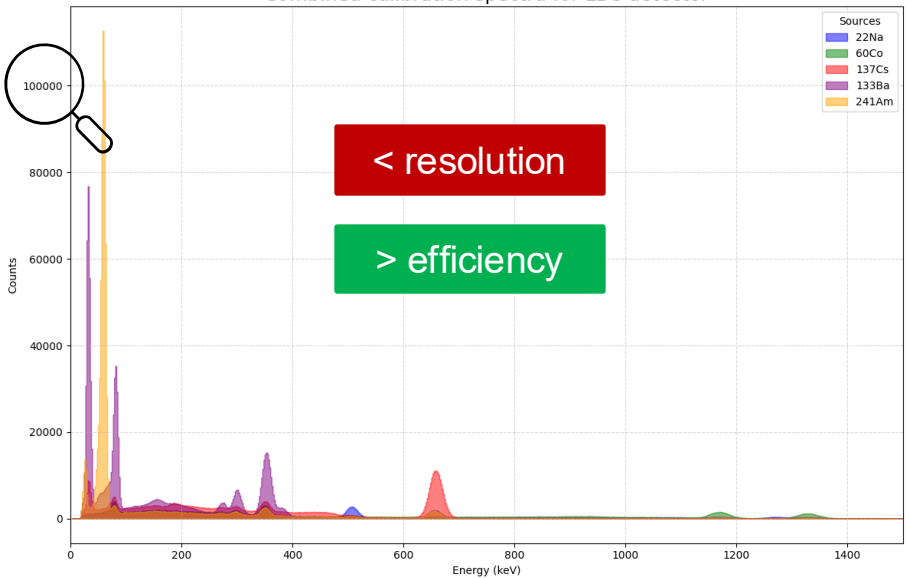


The LBC spectra ☺

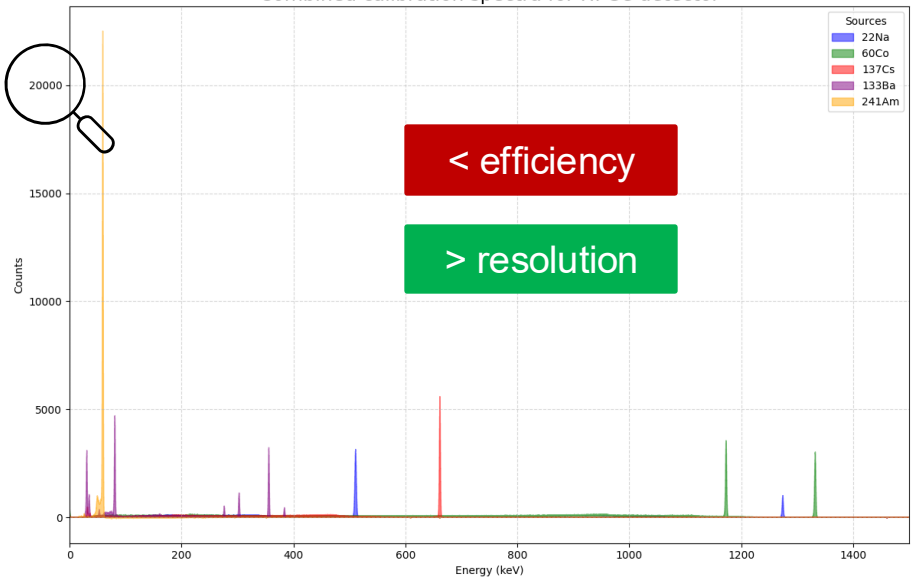


The two spectra: LBC and HPGe

100k



20k



Thanks