LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS
partículas e tecnologia

[Target Production]

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1.
Target

What it is and what it is used for?

Target

- Thin films can be a layer, a multi-layer or a mix of materials
- Have applications in nuclear physics, optics and eletronics
- Designed with Thermal Evaporation using the evaporator in FCUL

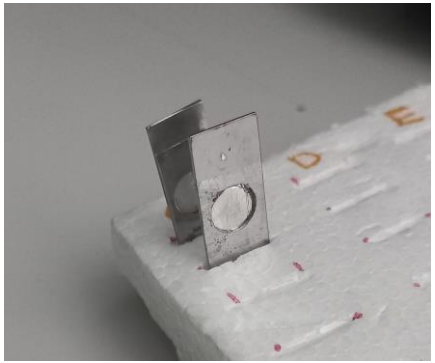

Fig. 1: Targets

2.
Thermal Evaporation

Evaporator and how it works

Thermal Evaporation

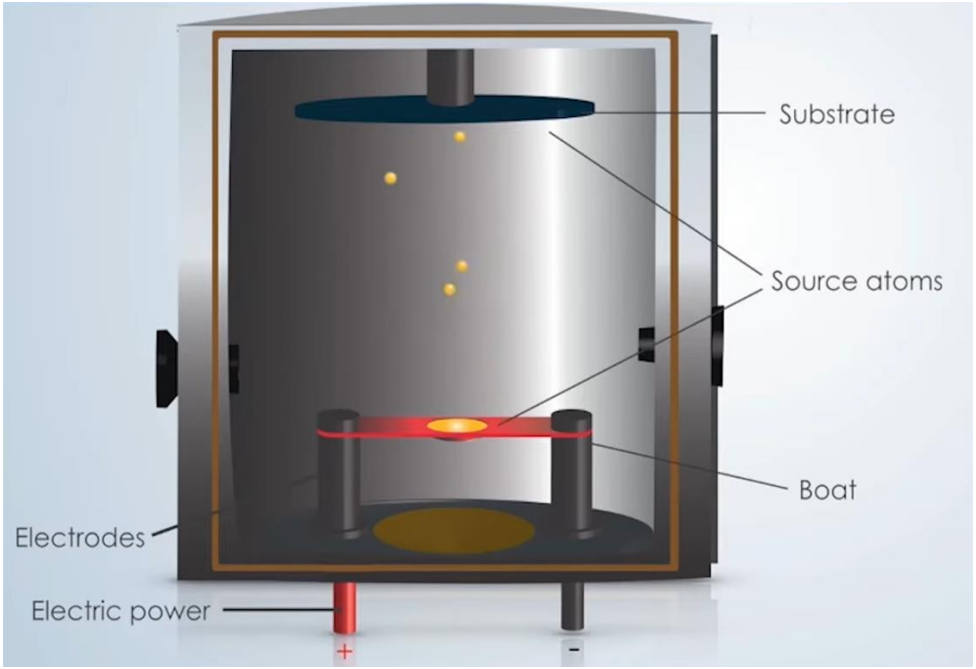

Fig. 2: Thermal Evaporation Process
Credits: Thermal Evaporation, video by Duke University - SMIF

Thermal Evaporation

Fig. 3: Cleaning the chamber

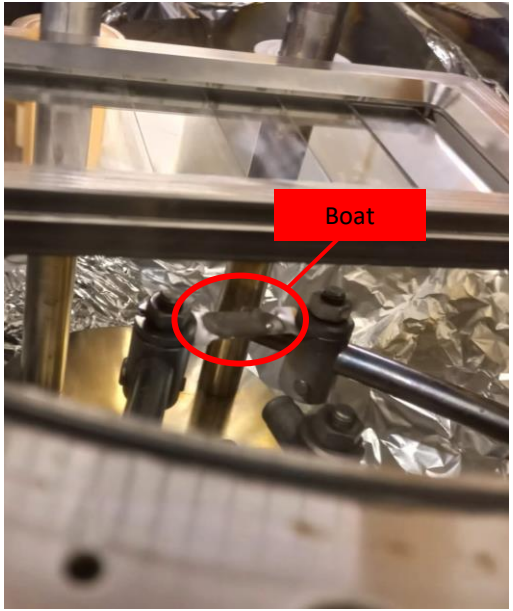

Fig. 4: Boats with Tin between electrodes

Fig. 5: Shelf with glass slides placed above the boat

Thermal Evaporation

Fig. 6: Closed chamber with vacum around 10^{-6} mbar

Fig. 7: Glowing coming for the boat inside the chamber

Fishing targets

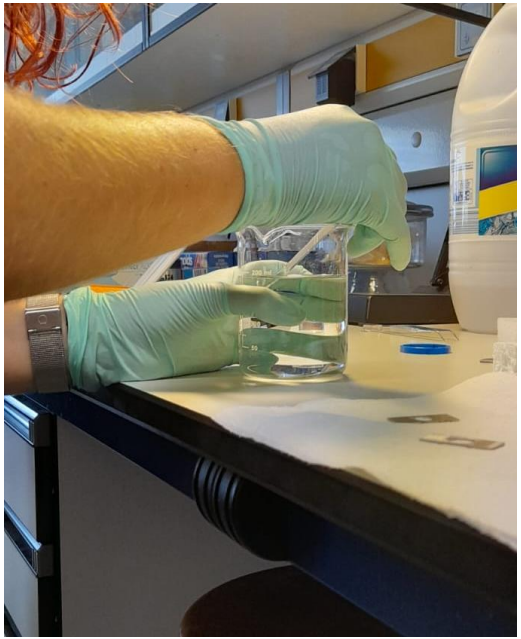

Fig. 8: Releasing the substract from the glass slide

Fig. 9: The frames and instruments used for fishing

Fig. 10: Produced targets

3.
Target Characterization

Alpha Loss Energy and RBS analysis and simulations

Alpha Loss Energy

- From the measured energy loss of alpha particle's, the thickness of a target is determinated

Fig. 11: Chamber

- Sn targets were analysed using a Ra-226 as alpha particle's source

$$\Delta x = \int_{E_i}^{E_f} -\left(\frac{dE}{dx}\right)^{-1} dE$$

Fig. 12: The dectetor and the source

Alpha Loss Energy

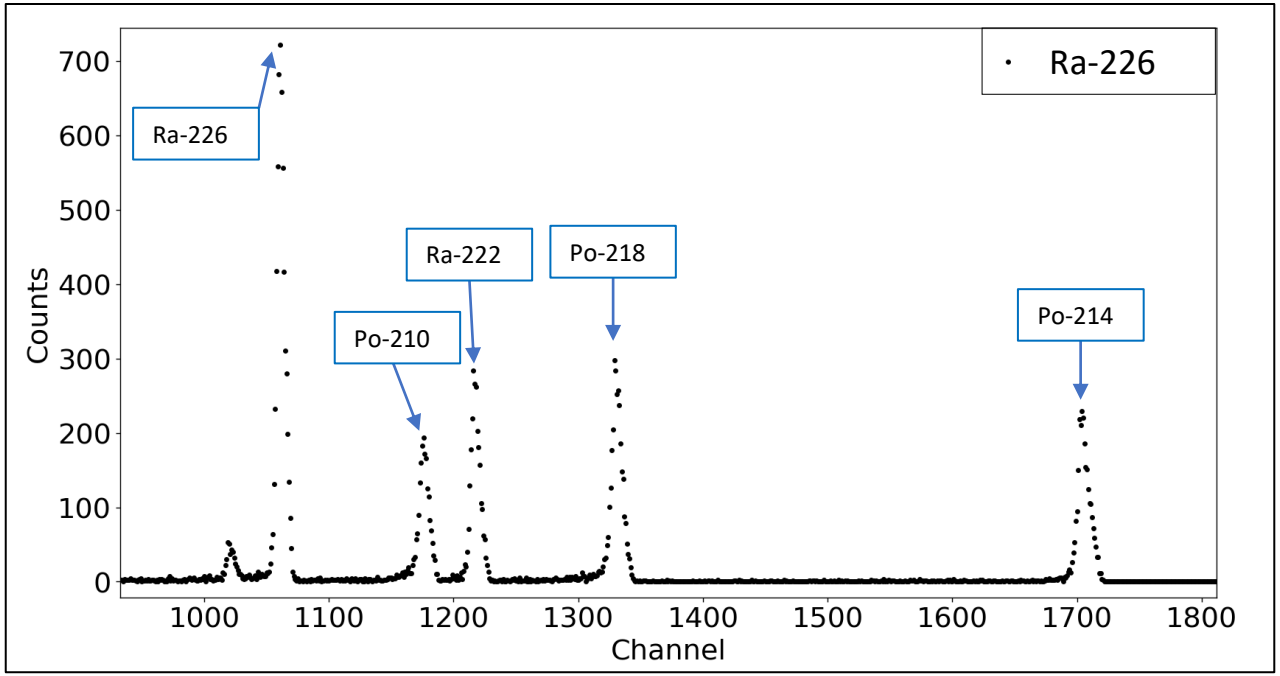

Fig. 13: Calibration for the Alpha Loss Energy

Alpha Loss Energy

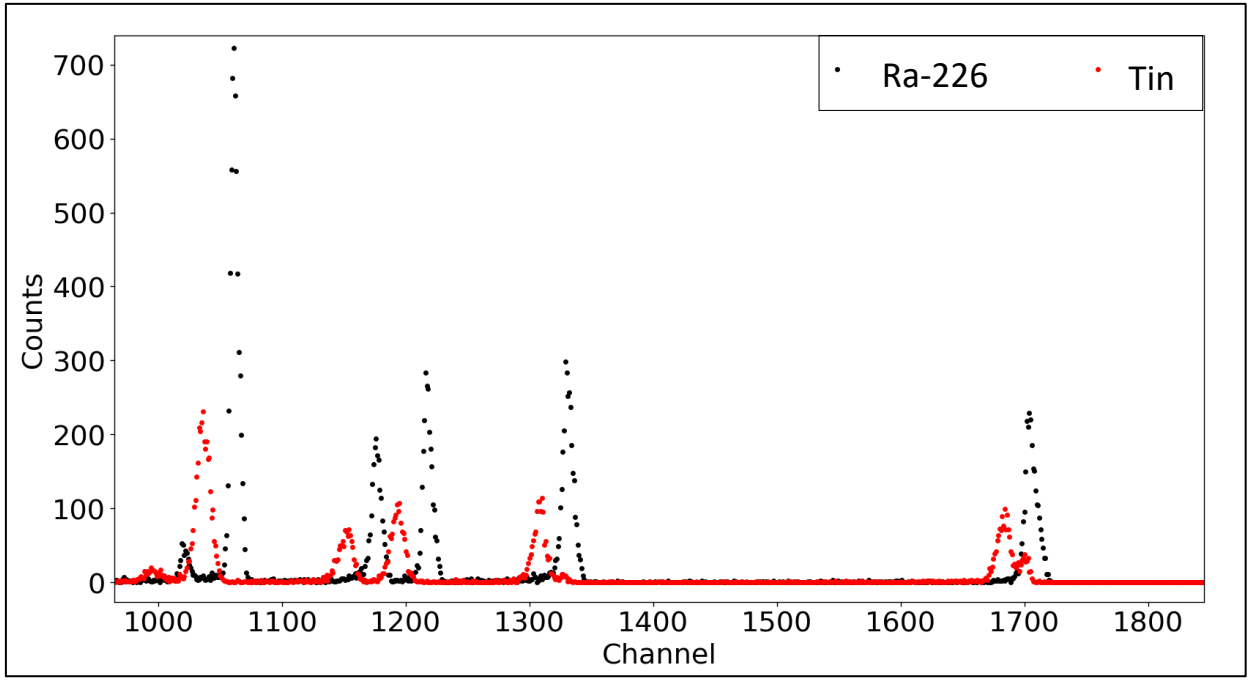

Fig. 14: Comparison between the energy of the detected alpha particles with and without the target between the source and the dectetor .

AlfaMC

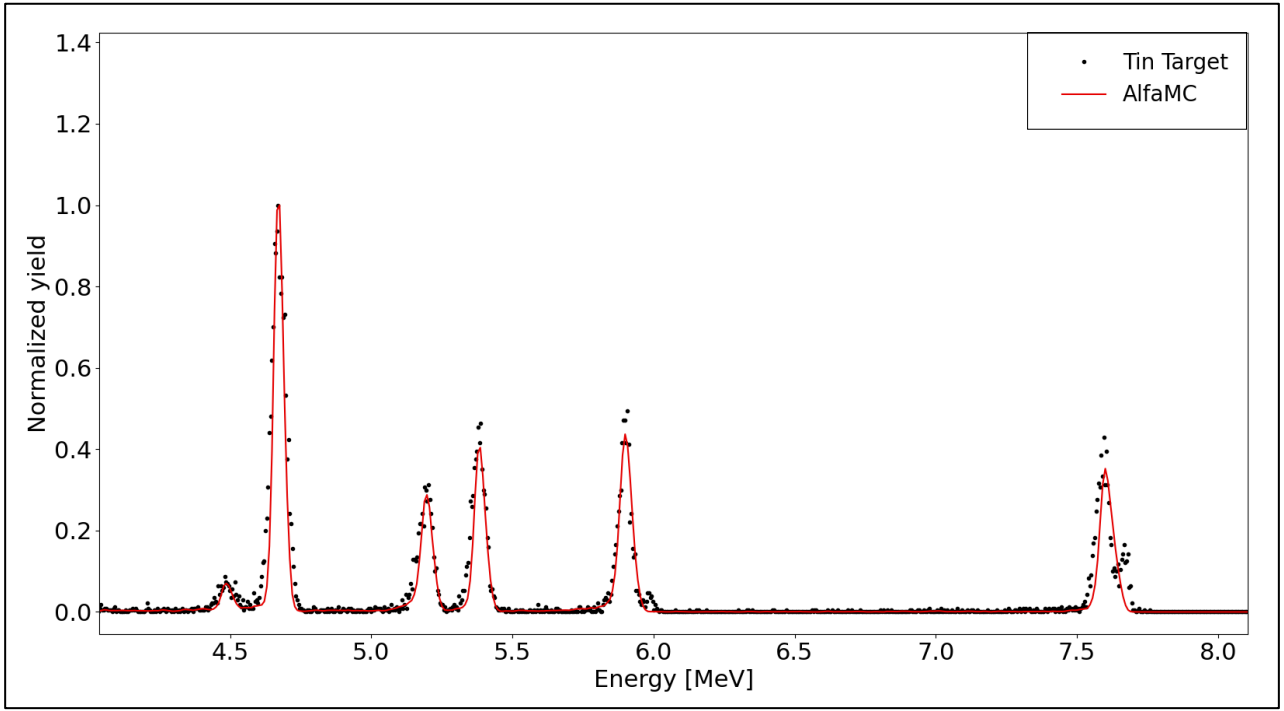

Fig. 15: Comparison between the simulated and the experimental values for a tin target

RBS

- Rutherford Backscattering Spectrometry

- Can be done by using one of the two accelerators of the CTN

- With kinematic factor, stopping power and the energy variation, we can determinate the thickness

Fig. 16: Chamber used in Tandem accelerator

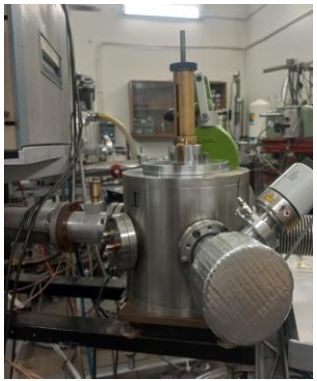

Fig. 17: Chamber used in Van de Graaff accelerator

RBS

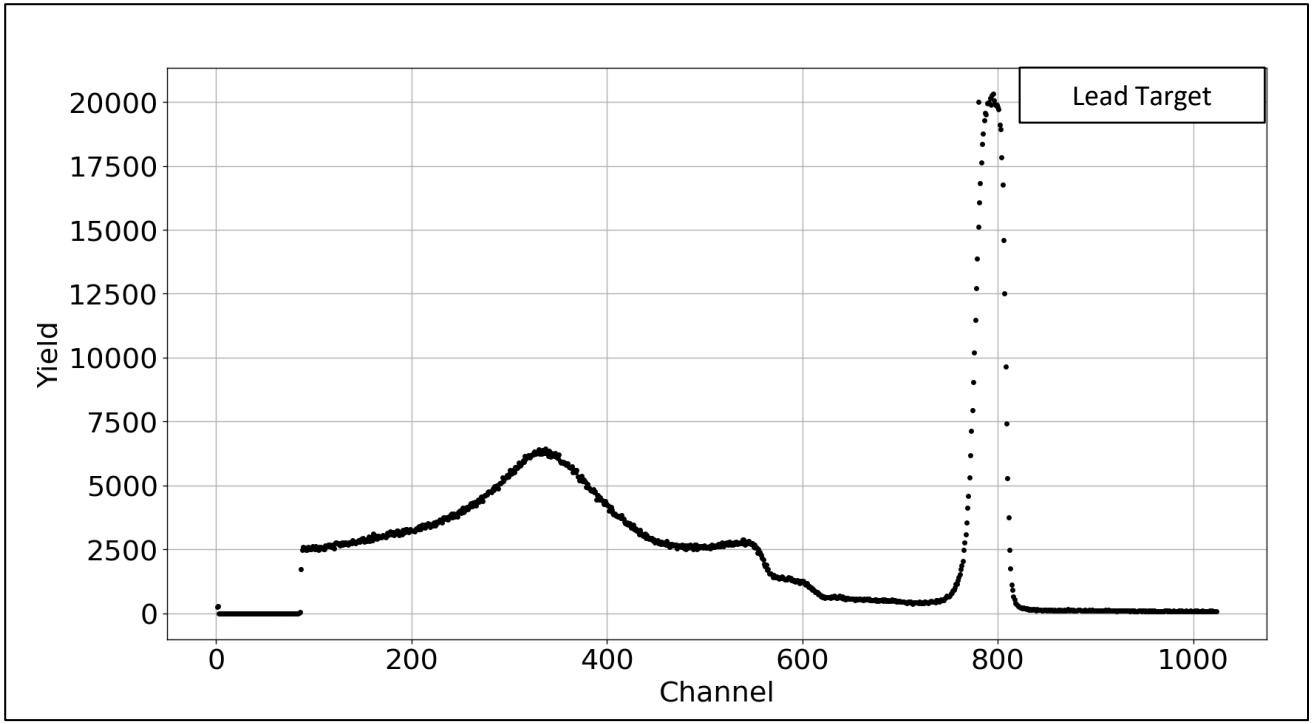

Fig. 16: Example of acquired data from Van de Graaff accelator in CTN using lead targets

SIMNRA

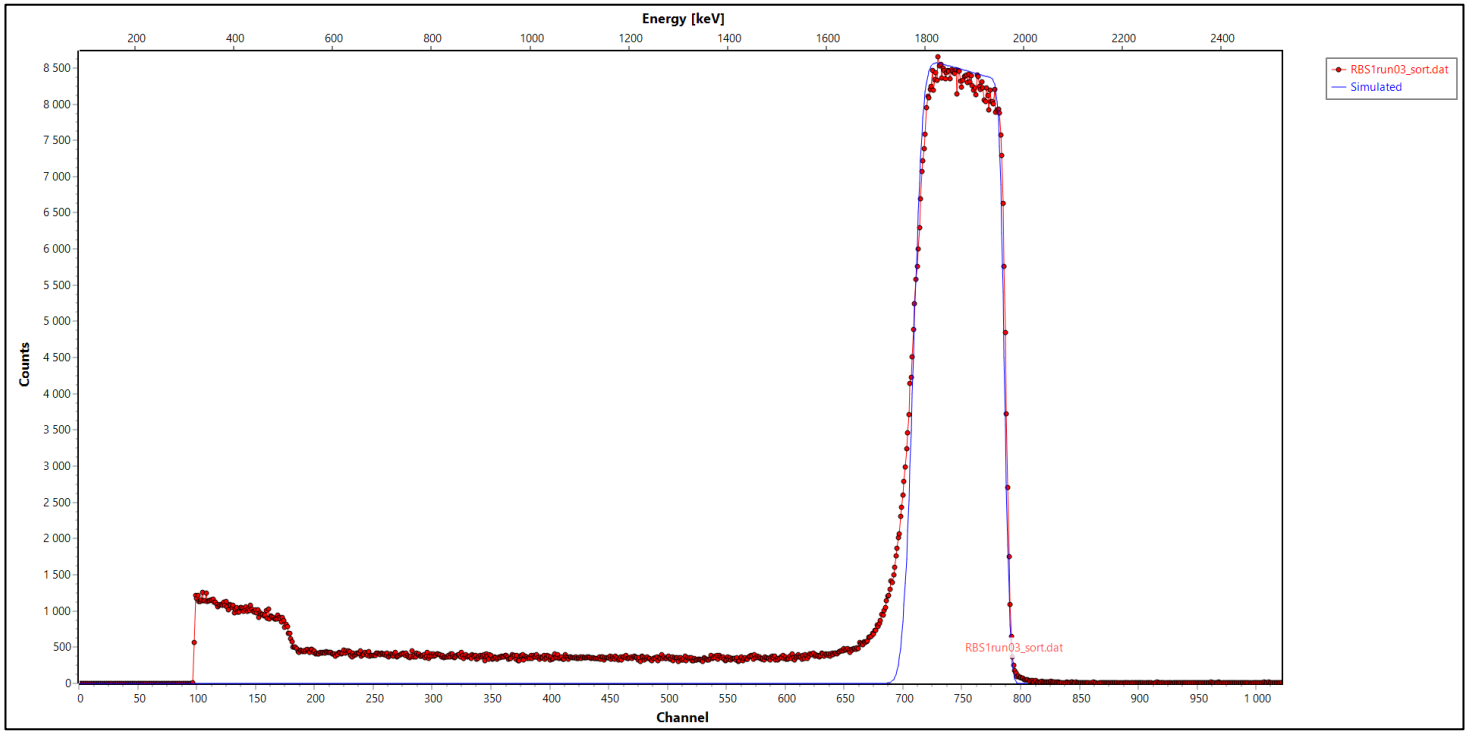

Fig. 17: Simulation using SIMNRA that compare the experimental data with simulated data.

4.
Summary