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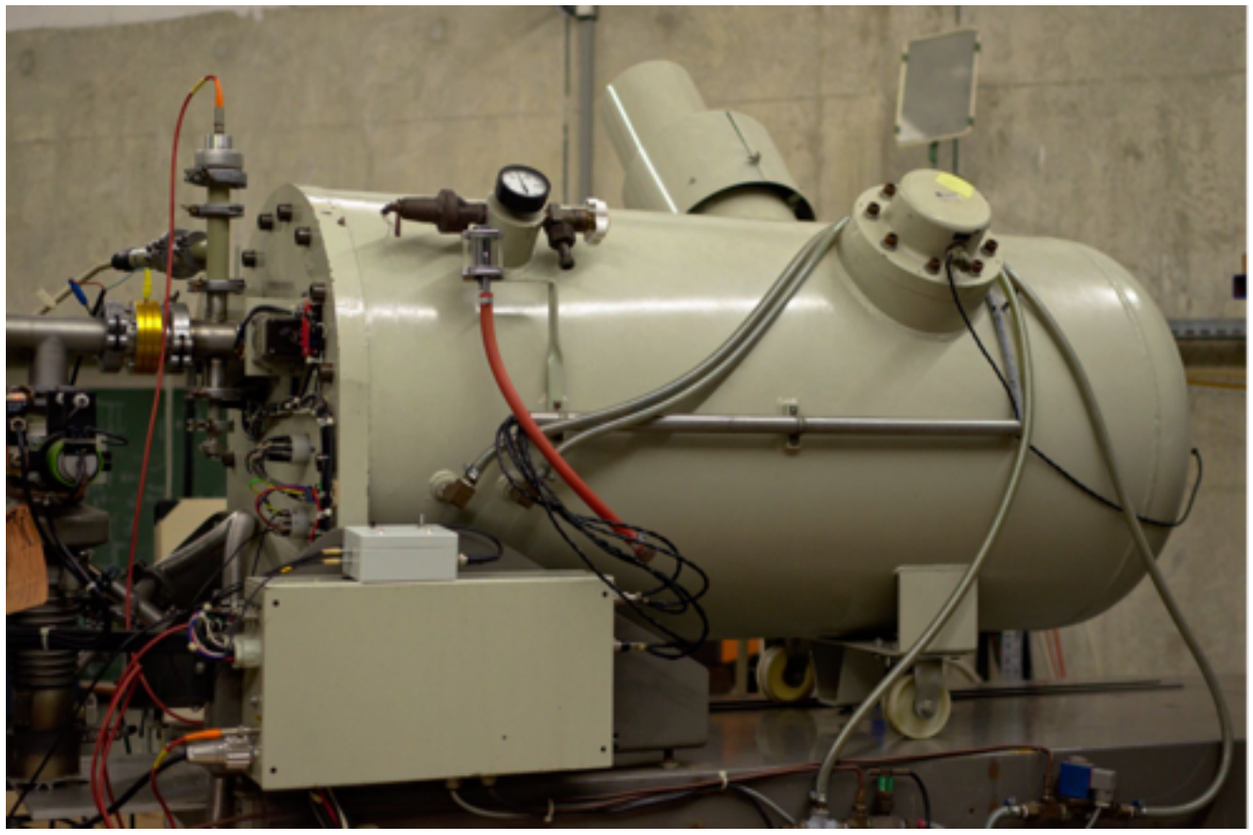
TRAVEAUX PRATIQUES 4: ACCÉLÉRATEUR VAN-DER-GRAAF

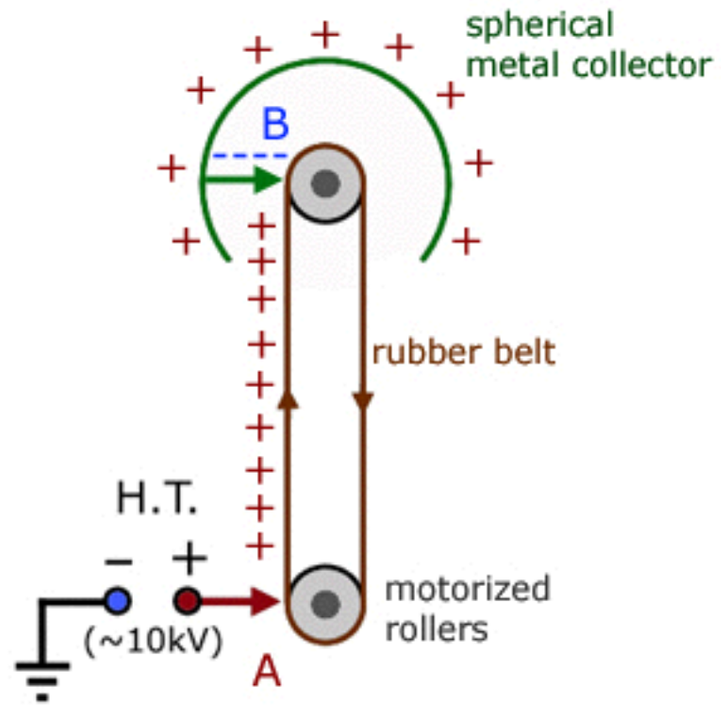
Introduction

Students on this project will:

- Understand the working principles of a particle detector
- Design and build a data acquisition (DAQ) system
- Calibrate and learn to understand the detector
- Analyse data to measure the velocity of neutrons produced in a fixed target experiment.

The accelerator



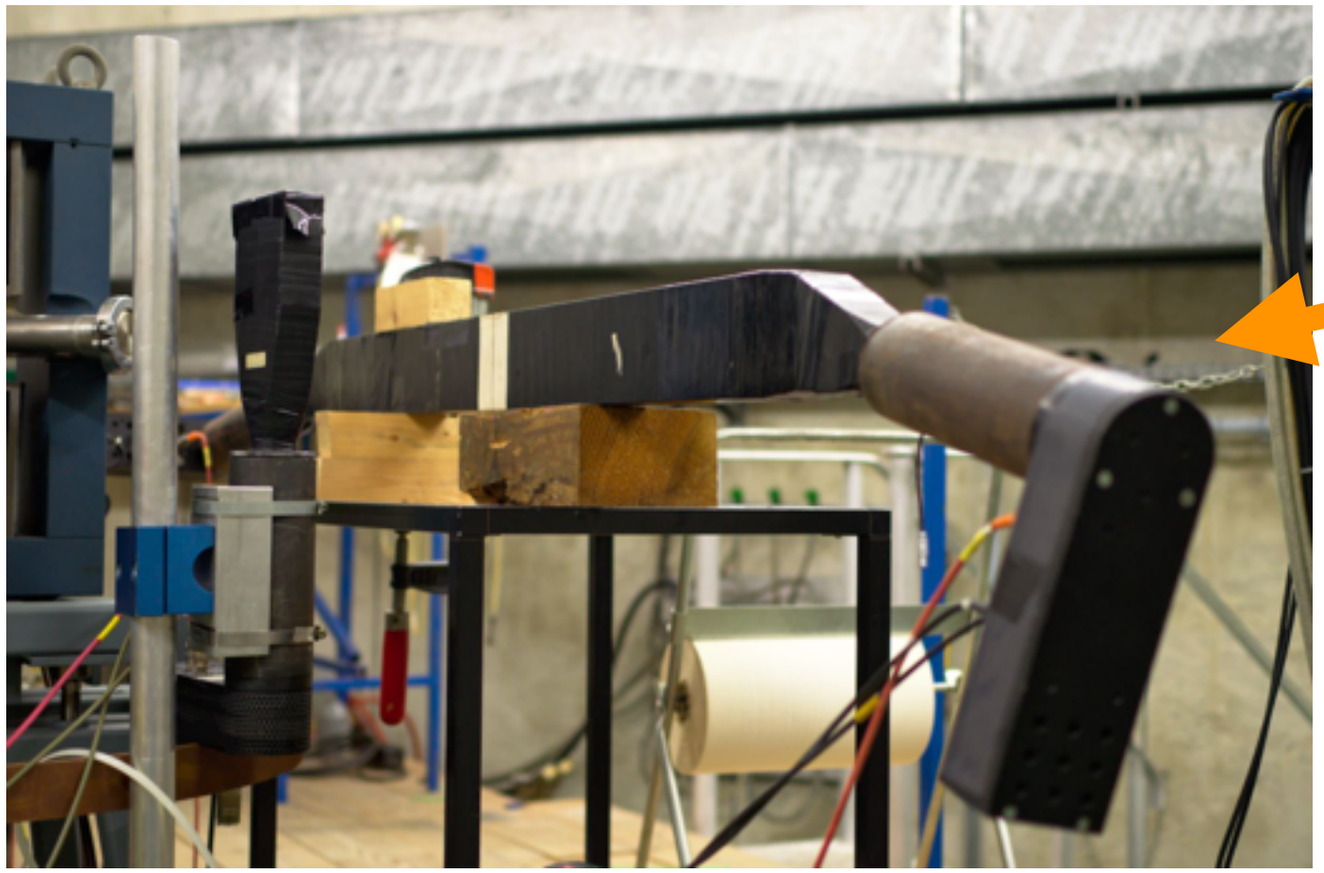


- The Van-der-Graaf accelerates ^{2}H to 300 keV
- Target: a fixed ^{3}H target. Fusion reaction:

$$^{2}H + ^{3}H \rightarrow ^{4}H + n$$

- Neutrons produced in a 2 → 2 reaction have a specific speed
- Goal: measure the speed to prove this reaction is happening!

The detector



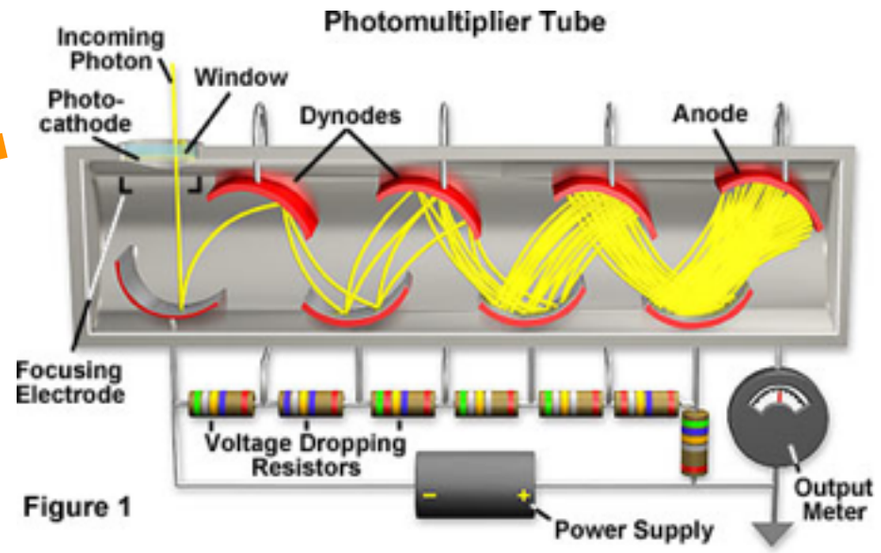
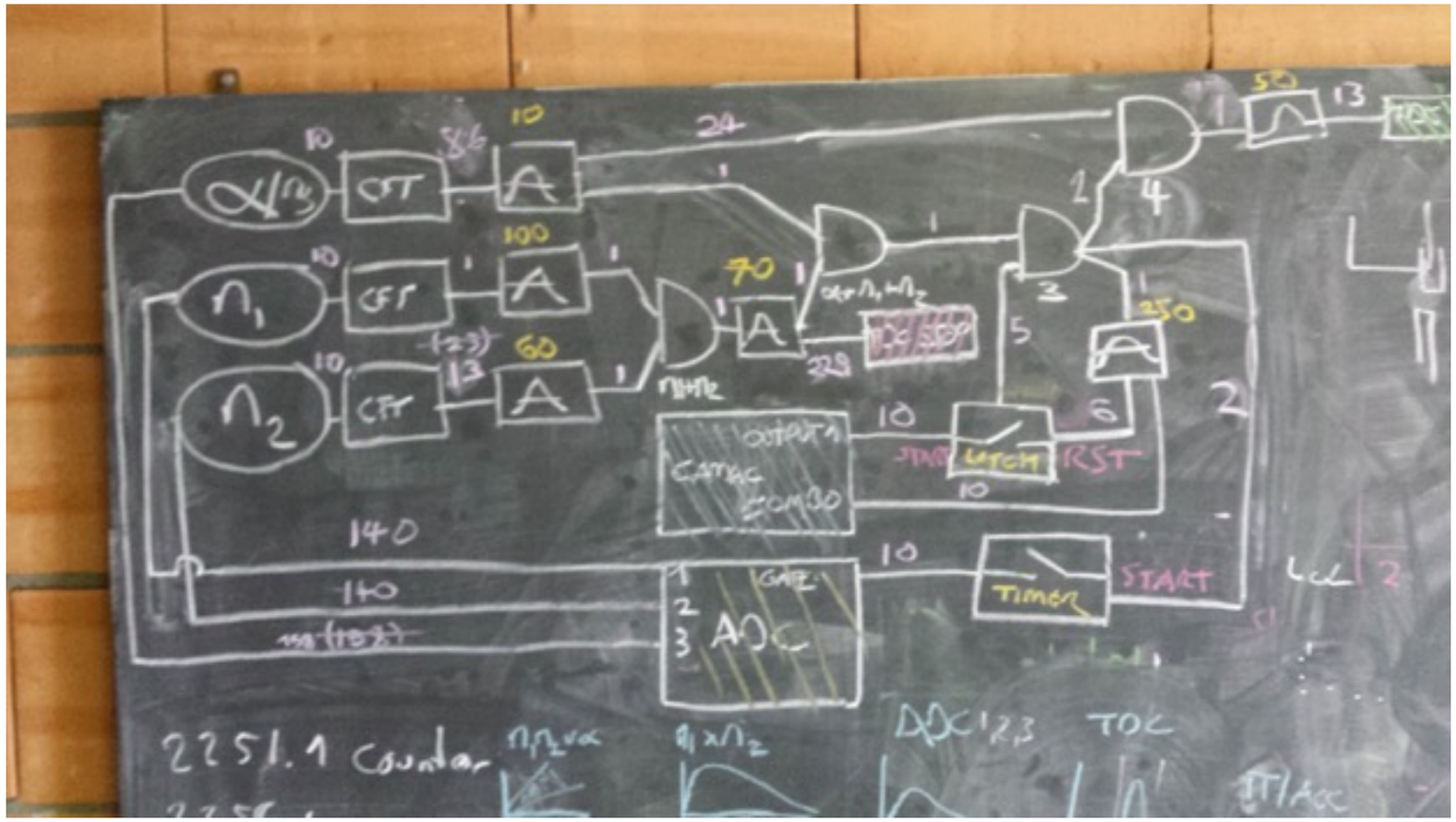


Figure 1

- Very high tech! Scintillator + photomultipliers.
- One detector close to the target and one moveable.
- Can measure coincidences and time delays.
- Use a ^{60}Co source to calibrate before using the accelerator.

The DAQ: trigger and readout



- CAMAC data acquisition boards (ADC, TDC, CTF, delays, etc)
- Need to build a trigger and readout to measure:
  - ✓ The energy spectrum of the neutrons
  - ✓ The time-of-flight (hence speed) of the neutrons

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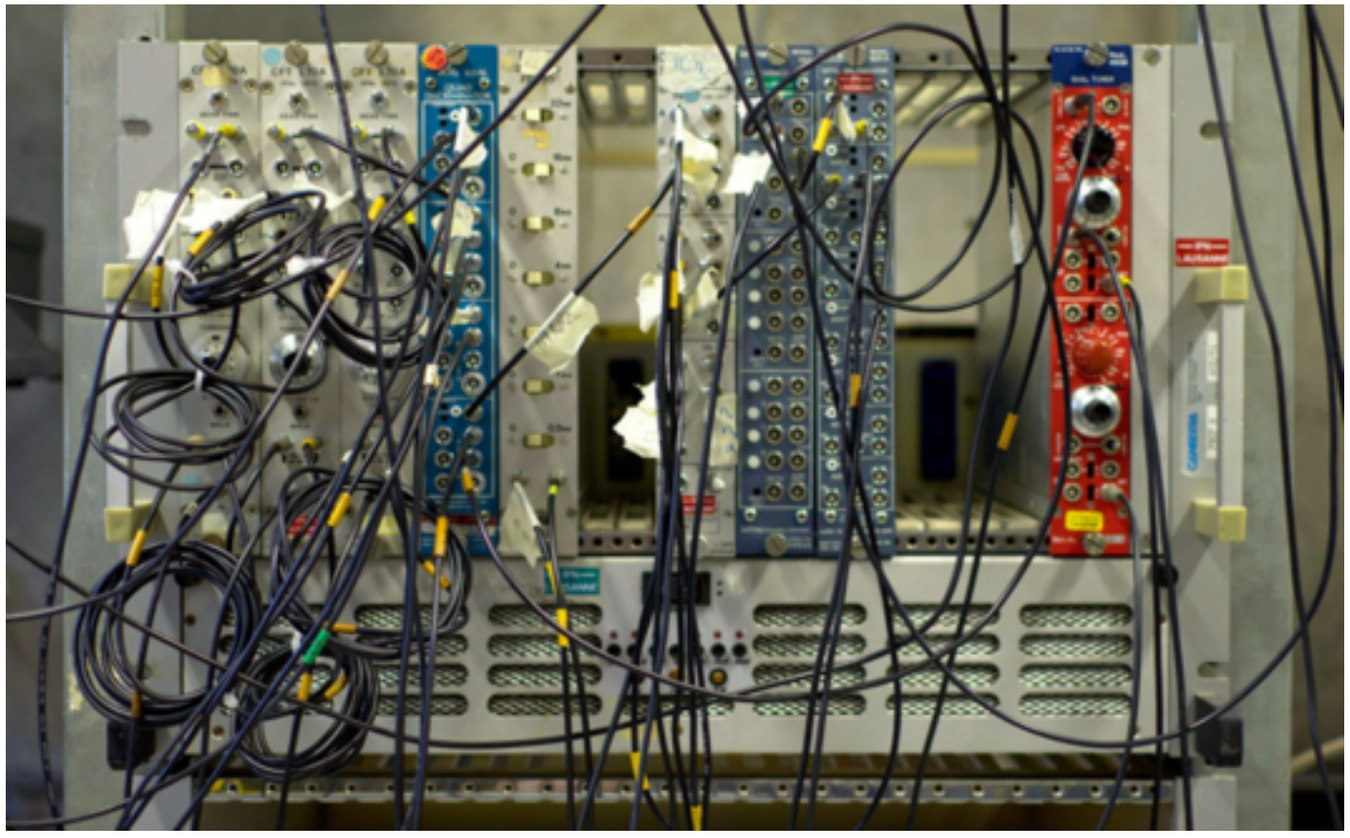

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Practical info

- Will use ROOT and RooFit for the data analysis part
- We can install it together. Best on Linux/Mac.

- Scheduled working time: Mondays full day
- Last day is 18th Dec, report on the 12th Jan.

- You can find me in BSP 614.4
- Fell free to contact me at luca.pescatore@epfl.ch at any time.

And now time for  !!