

A. Bay, L. Pescatore
TRAVAUX PRATIQUES 4:
ACCÉLÉRATEUR VAN-DER-GRAAF

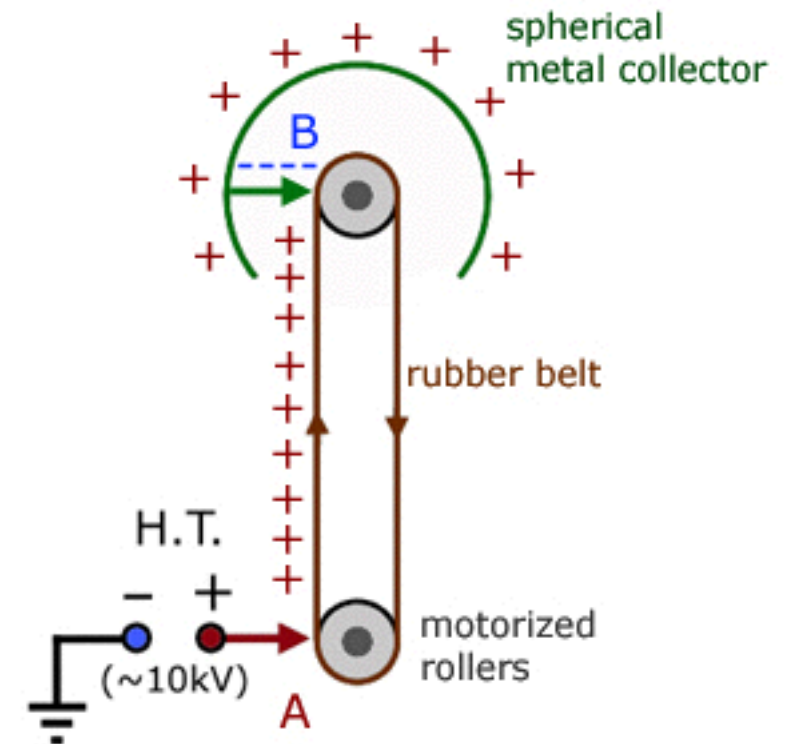
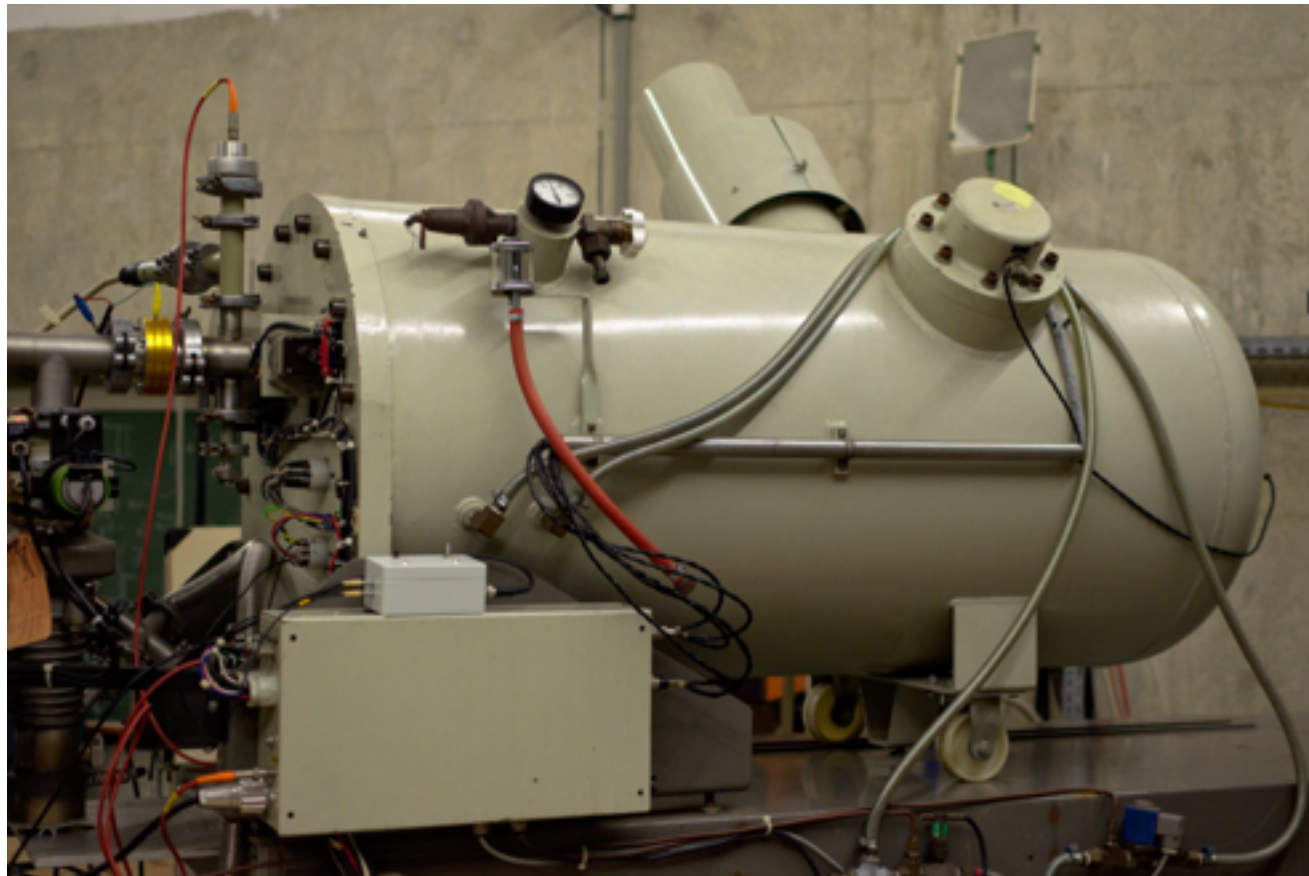
Introduction



Students on this project will:

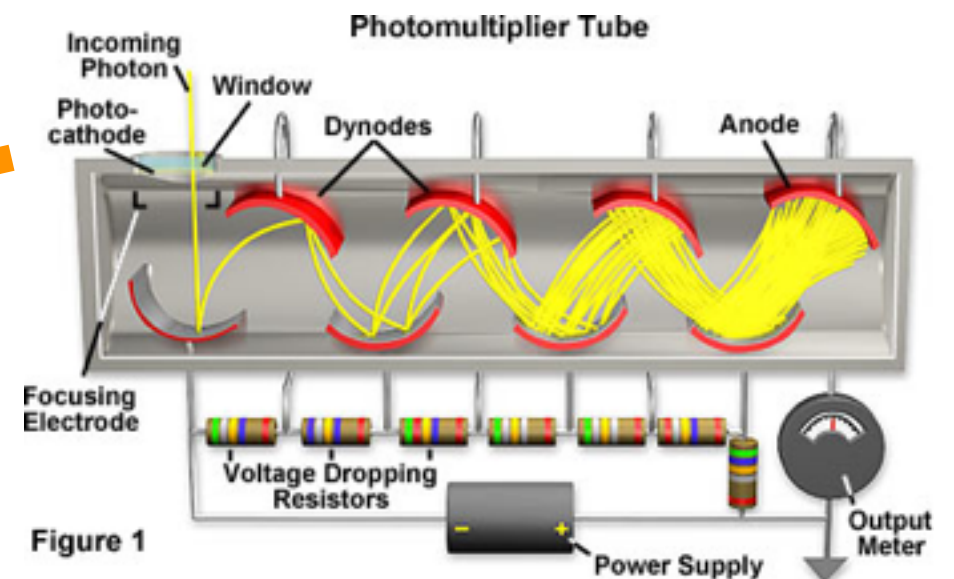
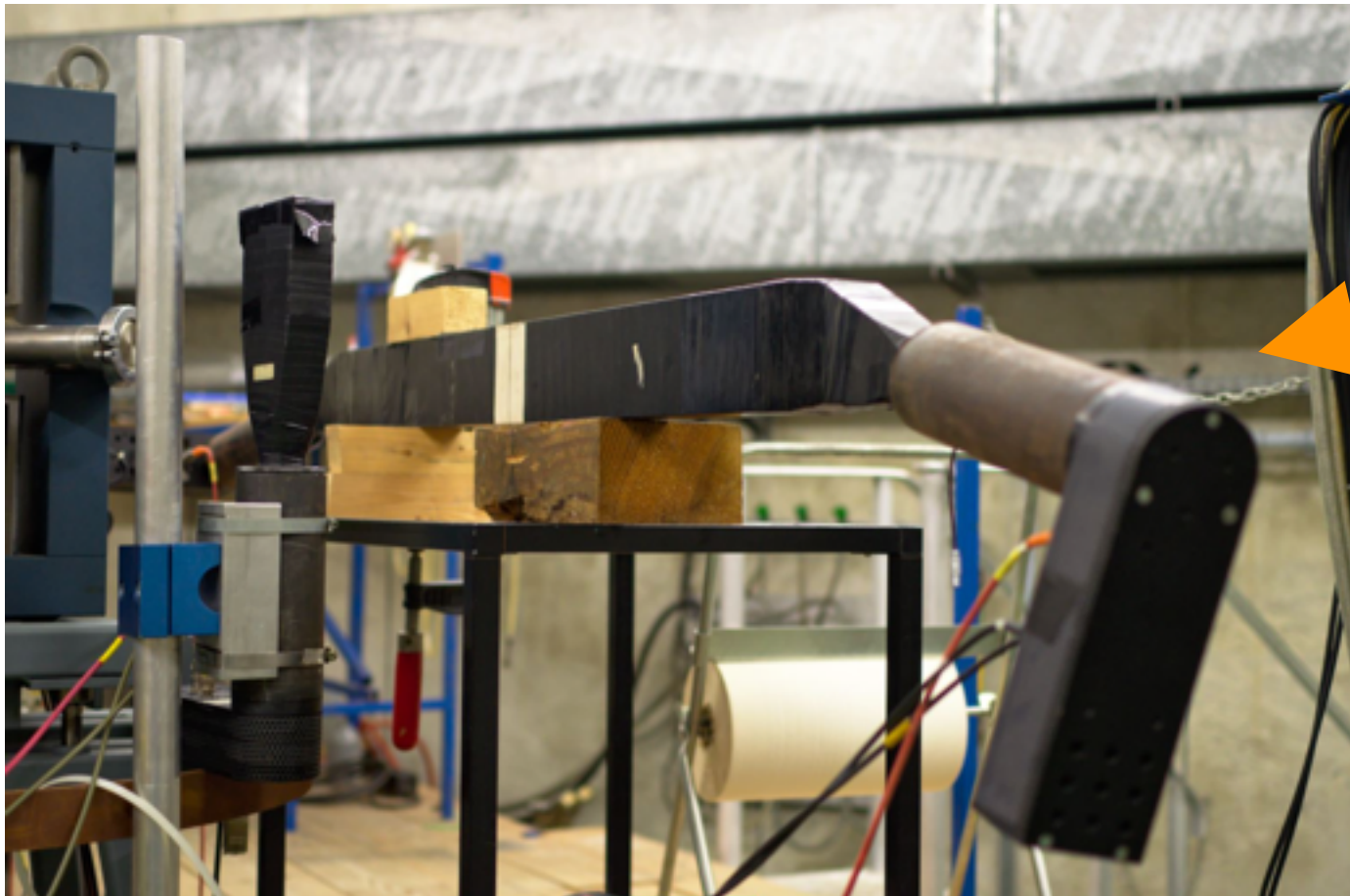
- Understand the working principles of a particle detector
- Design and build a data acquisition (DAQ) system
- Calibrate and learn to understand the detector
- Analyse data to measure the velocity of neutrons produced in a fixed target experiment.

The accelerator



- The Van-der-Graaf accelerates ^2H to 300 keV
- Target: a fixed ^3H target. Fusion reaction:
$$^2\text{H} + ^3\text{H} \rightarrow ^4\text{H} + n$$
- Neutrons produced in a $2 \rightarrow 2$ reaction have a specific speed
- Goal: measure the speed to prove this reaction is happening!

The detector

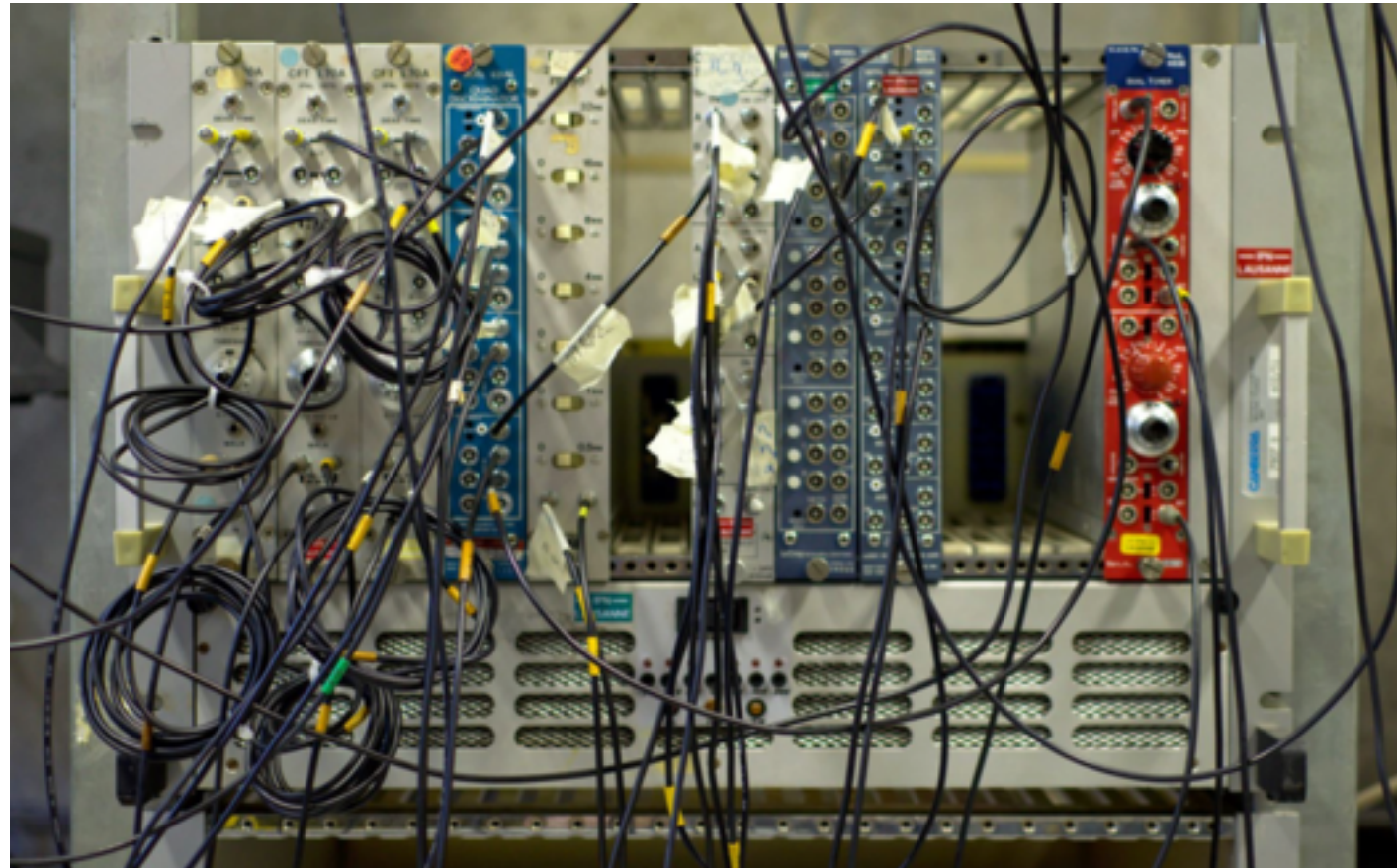


- Very high tech! Scintillator + photomultipliers.
- One detector close to the target and one moveable.
- Can measure coincidences and time delays.
- Use a ^{60}Co source to calibrate before using the accelerator.

Hand-drawn schematic diagram of a digital logic circuit, likely a counter or timer. The circuit includes three input channels (X/n₁, n₁, n₂) each with a counter (CT) and an accumulator (A). These are connected to a 7413 decoder, a 7415 latch, and a 7416 timer. The output is a 7417 LED display showing '13'. The diagram is labeled with various components and values, including '2251.1 Counter', '7413', '7415', '7416', '7417', and '13'.

- L. PESCATORE - LPHE TP4

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

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
- Feel free to contact me at luca.pescatore@epfl.ch at any time.



And now time for



!!