# THE CORSET TIME-OF-FLIGHT SPECTROMETER FOR MEASURING BINARY PRODUCTS OF NUCLEAR REACTIONS

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## SCOPE

- Aim
- Experimental Setup
- MCP Based Detectors
- Calibration
- Calculations & Results

## AIM

- The CORSET is used to investigate the properties of collective motion of nucleons inside the nucleus and the time characteristics of the nuclear interaction process.

- Studying the binary products of nuclear reactions.

- Deduction of mass-energy distribution of fragments.

# Experimental setup

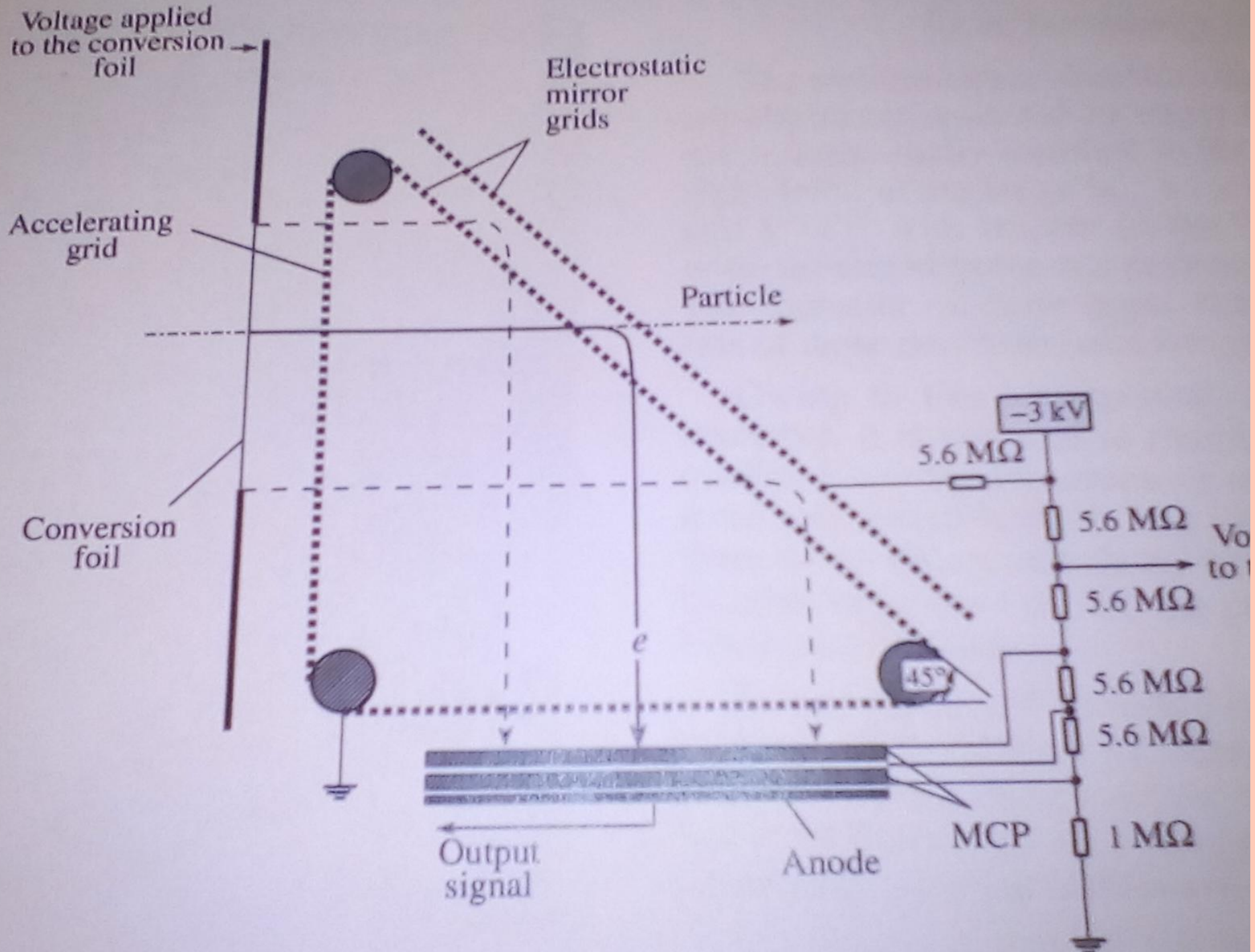
CORSET spectrometer consists of:

- Two identical TOF arms, MCP based start and stop
  - Velocity of both fragments
- Several V-E Telescopes, two MCPs, elecrostatic-mirrors and semiconductor detector.
  - Mass and energy of a single fragment
  - Angular distribution (discriminate)

# MCP BASED DETECTOR

The principle of the detector with electrostatic mirrors is based on  secondary emission of electrons.

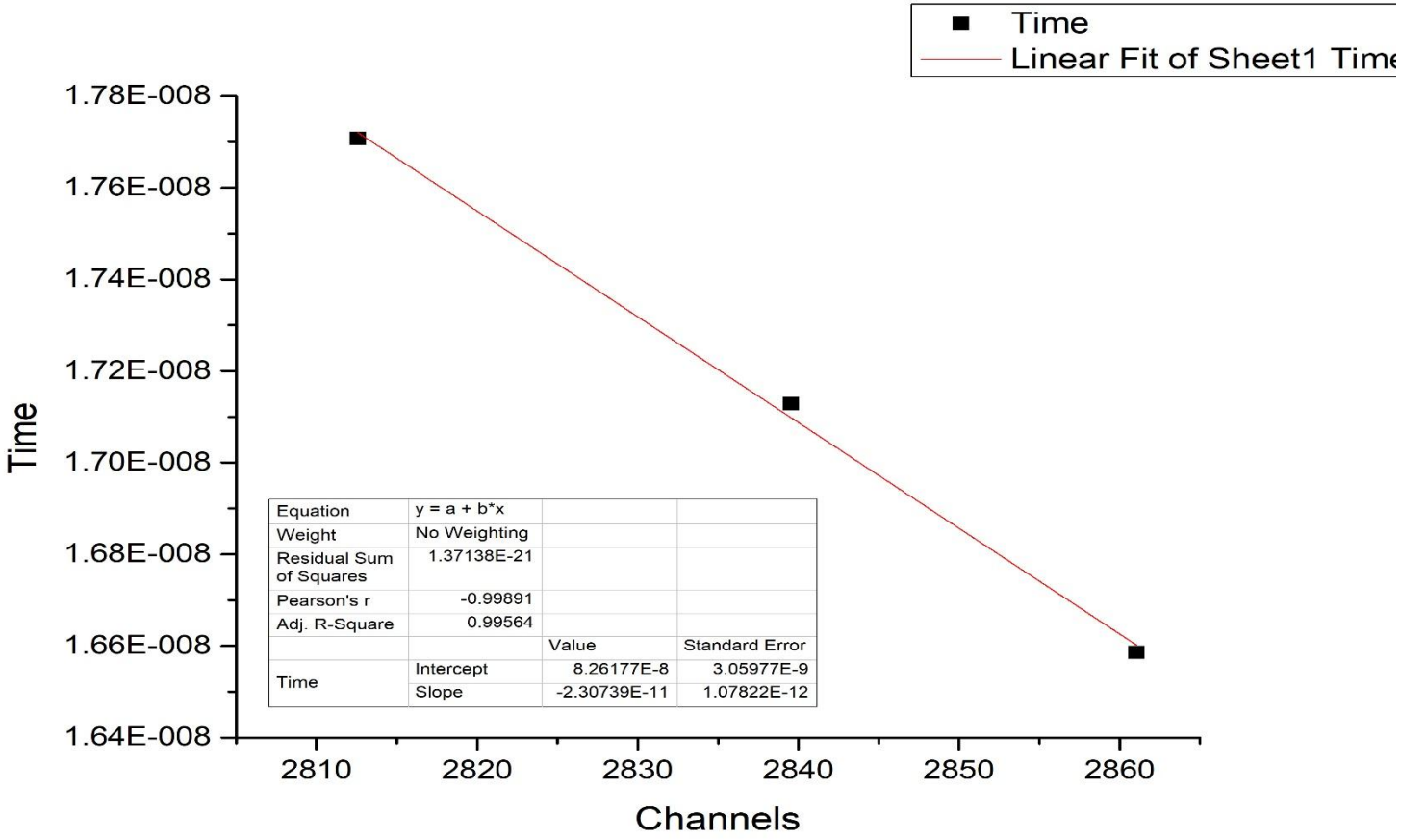
- **Start detector:** Conversion foil, accelerating grid, electrostatic mirrors AND chevron MCP assembly
  - Timing signal
  - Supplied with high voltage divider (~3keV)


Voltage applied to the conversion foil
Electrostatic mirror grids
Accelerating grid
Particle
Conversion foil
e
45°
−3 kV
5.6 MΩ
5.6 MΩ
5.6 MΩ
5.6 MΩ
5.6 MΩ
1 MΩ
MCP
Anode
Output signal

- **Stop detector:** Conversion foil, 2 MCPs and coordinate system
  - Two relay lines for each coordinate.
  - The electrons escaping from the MCP are collected in one relay line.
  - Coordinates determined from difference in arrival time of Timing signal and signal from the collection relay line
- Two paths for determining TOF
  - St1 and Sp1 ( CFD, Trigger, TAC, ADC)
  - St1, Sp1, X-Y and trigger (TDC via independent relays)
  - Duplication: Accuracy, nonlinearity and noise monitoring

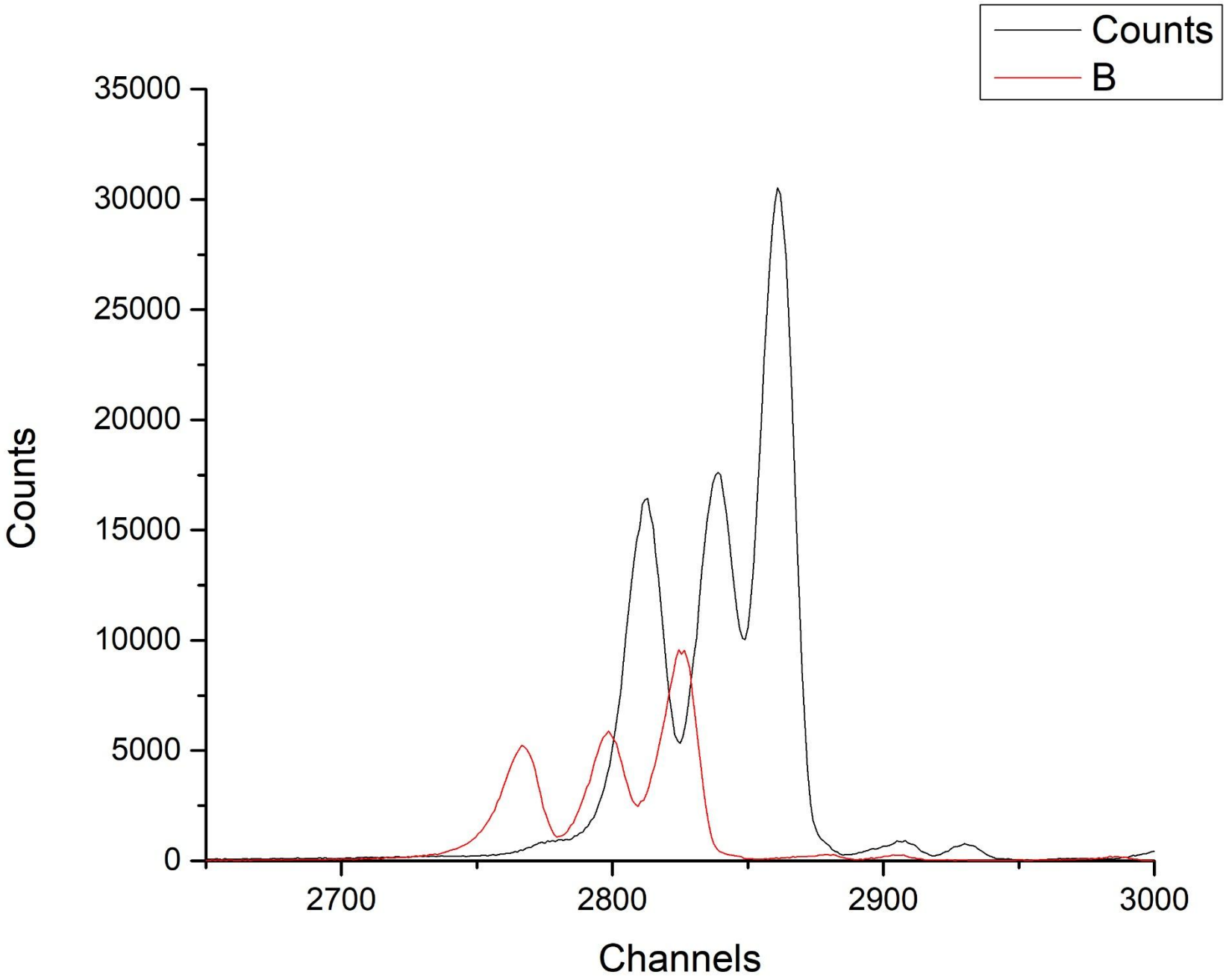
# Calibration

- Triple alpha source with known energies
- Calibration spectrum



# CALCULATIONS

- 2nd Measurements done with Mylar foil between the same triple alpha source and the target.
- Energy shift calculated from the calibration spectrum.
- Using the foil's stopping power (SRIM) and the calculated energy shift, the foil thickness was calculated


Counts
B
35000
30000
25000
20000
15000
10000
5000
0
Counts
2700
2800
2900
3000
Channels

# RESULTS

| Energy(keV) | Thickness (microns) | Thickness(mg/cm$^2$) |
|---|---|---|
| 542.051 | 4.88 | 0.0639 |
| 511.847 | 4.61 | 0.0604 |
| 532.054 | 4.79 | 0.0628 |
| Aveg | 4.76 | 0.0624 |

# QUESTIONS?


THANKYOU...