

A new detector for measuring proton recoils in H

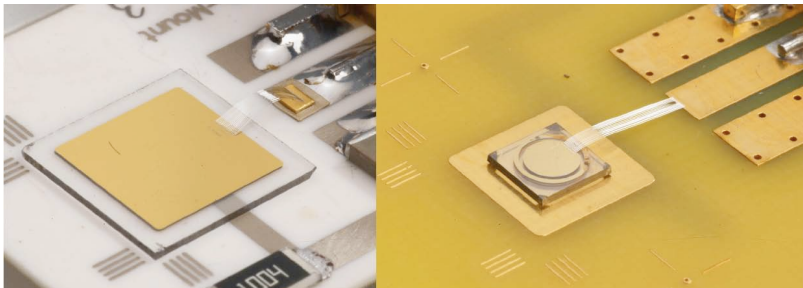
Pavel Kavargin

CIVIDEC

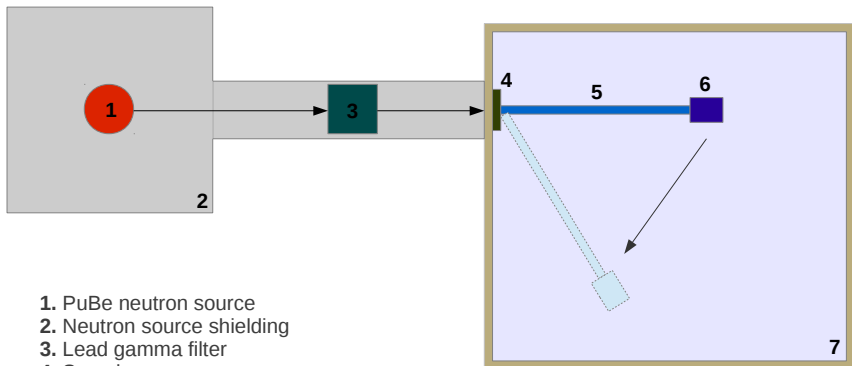
November 27th, 2013

- **Current status:**
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 - n_TOF, CERN

CIVIDEC Instrumentation



Proton Recoil Spectrometer

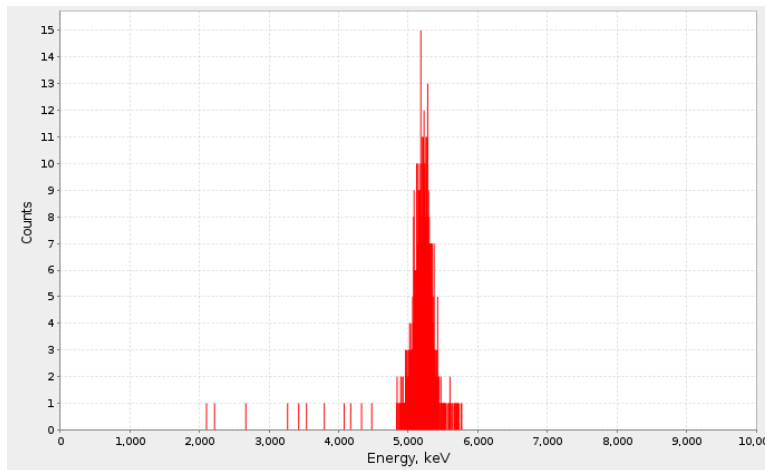


1. PuBe neutron source
2. Neutron source shielding
3. Lead gamma filter
4. Sample
5. Adjustable rod
6. Diamond detector
7. Vacuum chamber

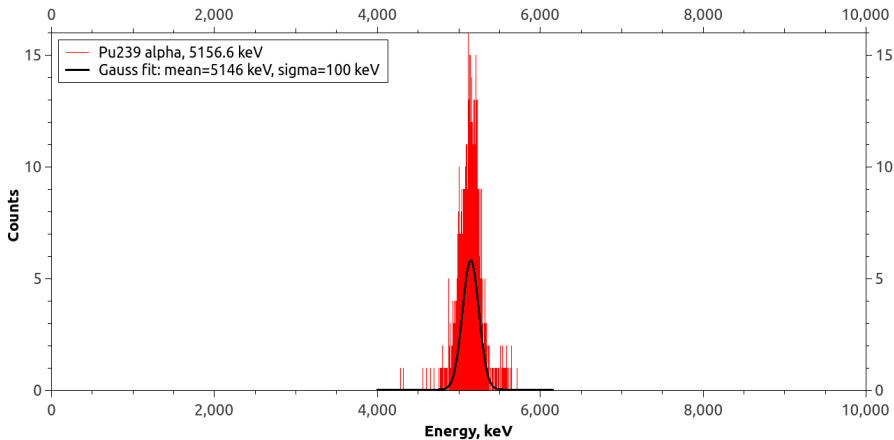
- Calibration with the Pu239 α source
- PuBe neutron source
- TRIGA monochromatic neutron beamline

Calibration with Pu239 alpha source

Calibration with Pu239 alpha source



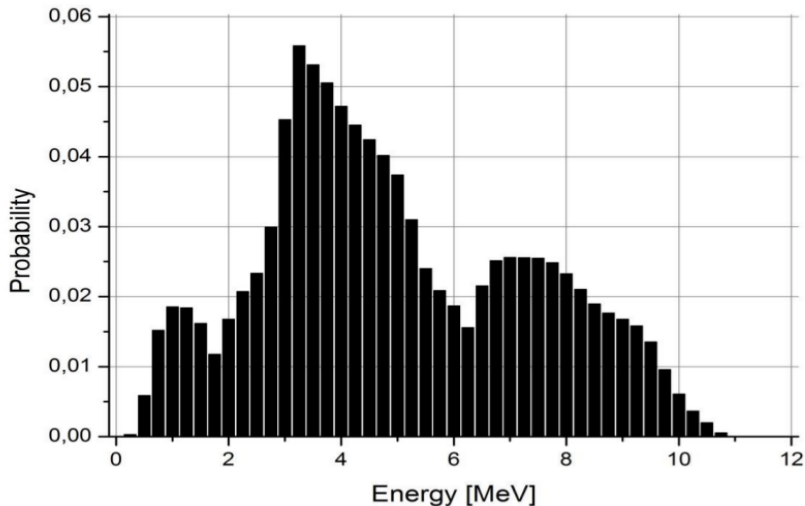
Calibration with Pu239 alpha source, Gauss fit



PuBe neutron source

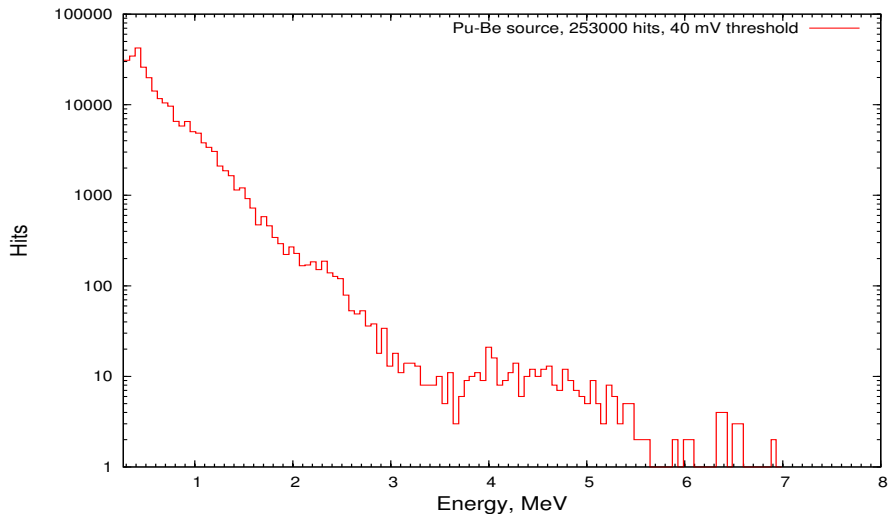
- PuBe neutron source
- Strength: $8 * 10^6$ n/s
- Energy < 11 MeV

Spectrum of the PuBe source



(S.Haas, "Simulation und Konstruktion eines neuen Messplatzes für die Pu-Be Laborneutronenquelle", TU Wien, 2012)

Background measurement with PuBe source



TRIGA monochromatic neutron beamline

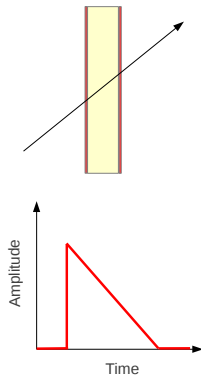
- Monochromatic neutron beam 2.6Å
- CIVIDEC diamond detector
- CIVIDEC C2 amplifier
- CIVIDEC ROSY AX106
- ${}^6\text{LiF}$ foil converter (provided by Prof. Paolo Finocchiaro)
- ${}^6\text{Li} + n \rightarrow {}^3\text{H}(2.73 \text{ MeV}) + \alpha(2.05 \text{ MeV})$

Expected energy deposit in the detector

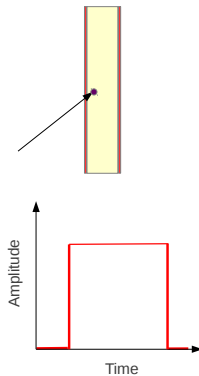
	α	triton
Incident energy (MeV)	2.05	2.73
Losses in air (MeV)	0.28 ± 0.04	0.05 ± 0.01
Losses in Pt, Ti, Au (MeV)	0.37 ± 0.05	0.06 ± 0.01
Expected energy deposit (MeV)	1.43 ± 0.09	2.62 ± 0.02

Pulse shape analysis

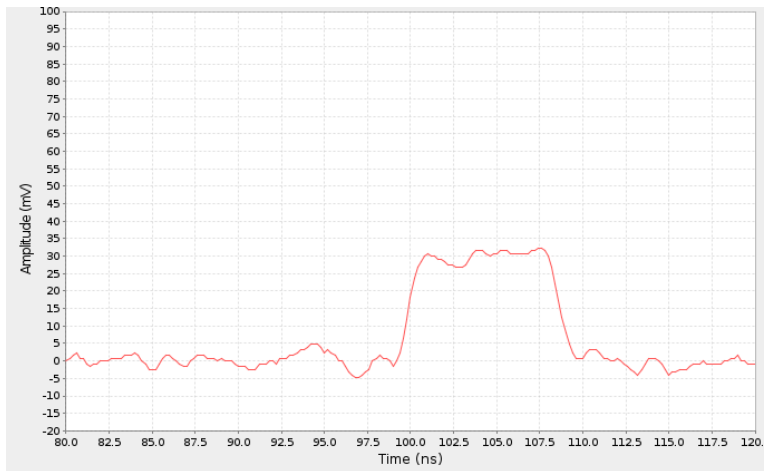
Triangular pulse shape



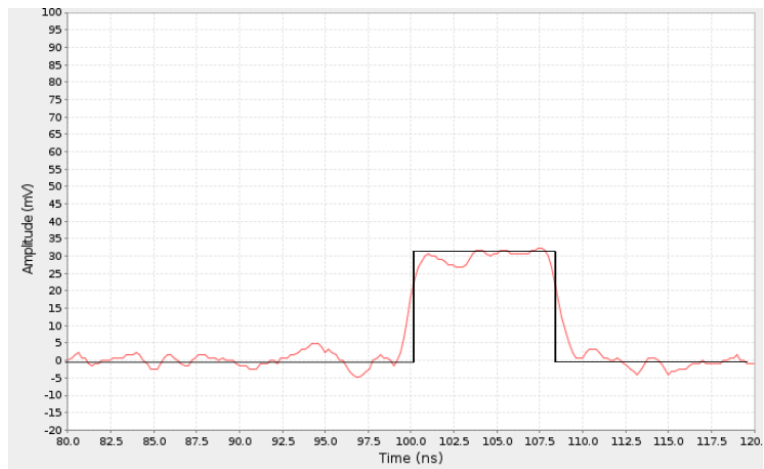
Rectangular pulse shape



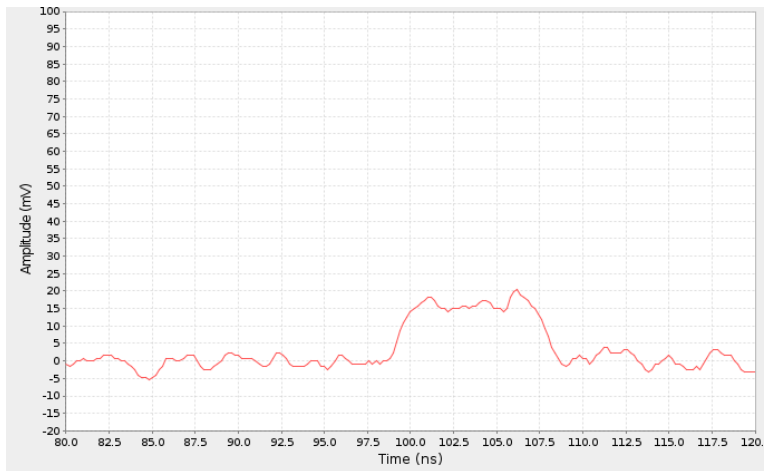
Rectangular pulse 1



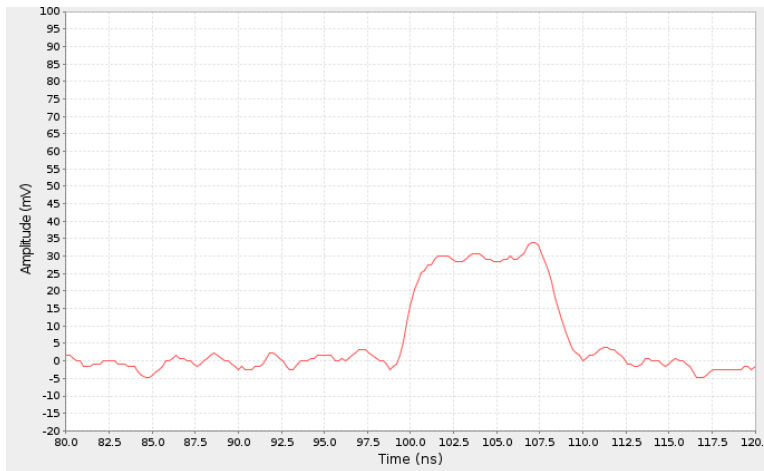
Rectangular pulse 1



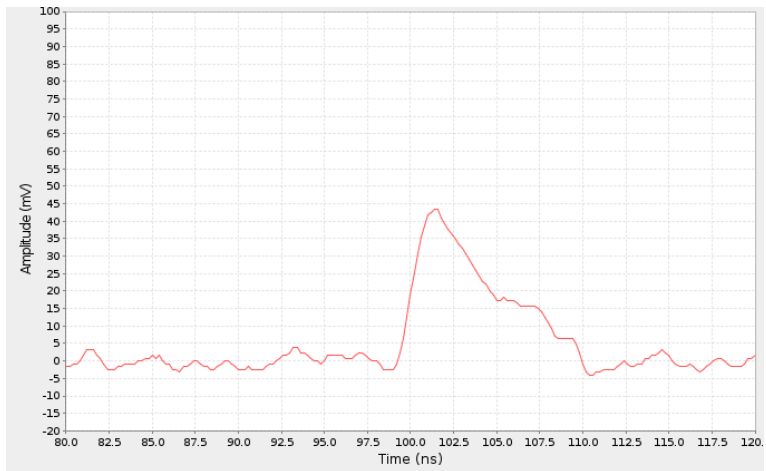
Rectangular pulse 2



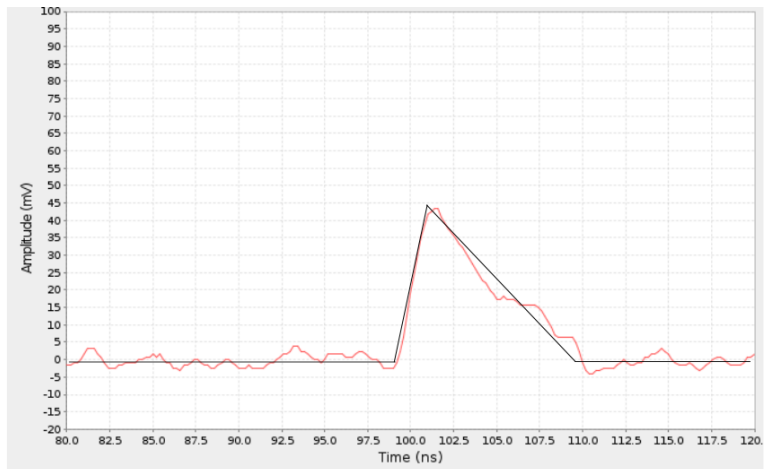
Rectangular pulse 3



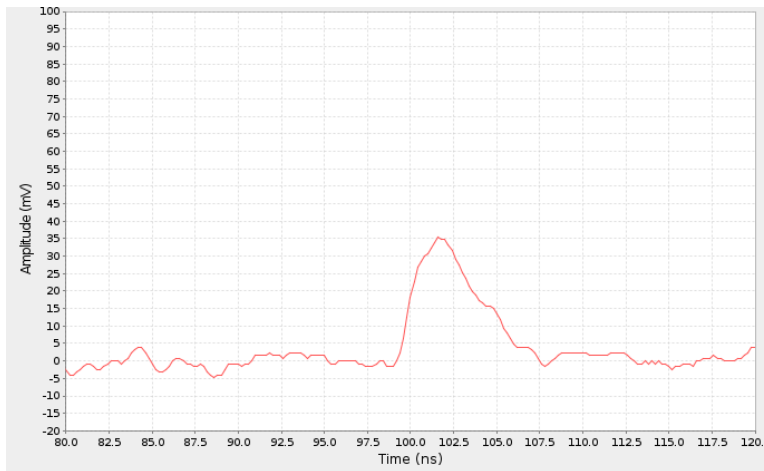
Triangular pulse 1



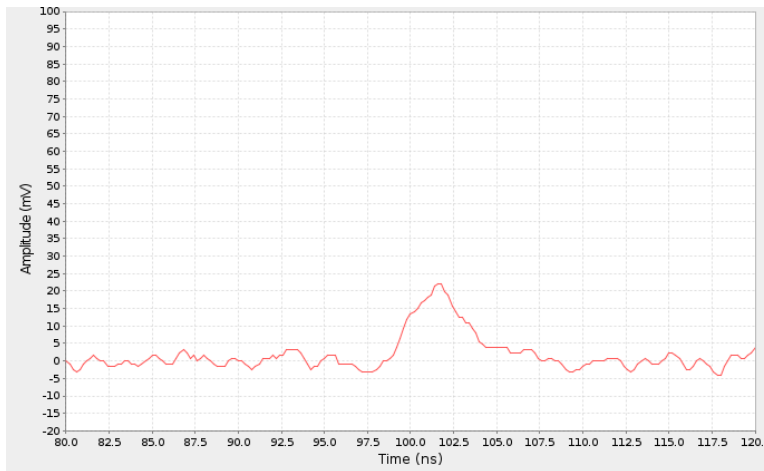
Triangular pulse 1



Triangular pulse 2



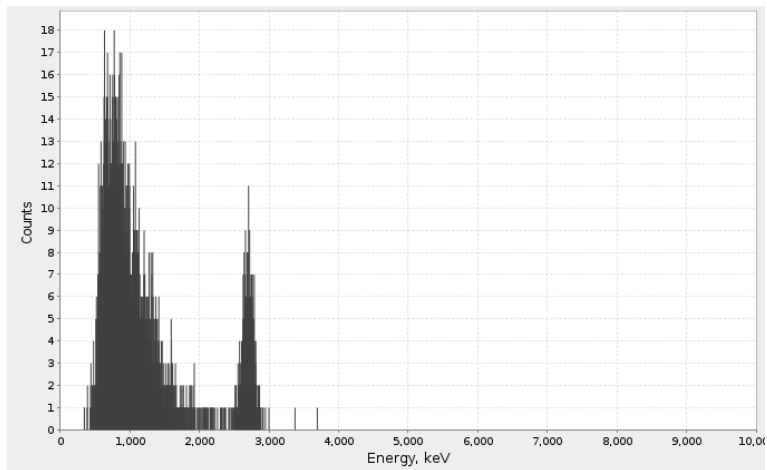
Triangular pulse 3



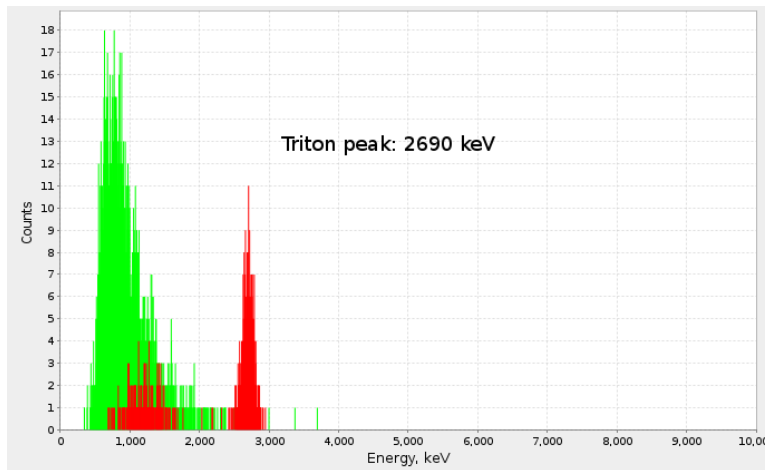
Pulse selection algorithms

- 1st derivative zero interval
- Pulse FWHM
- Pulse area
- Reference pulse fitting

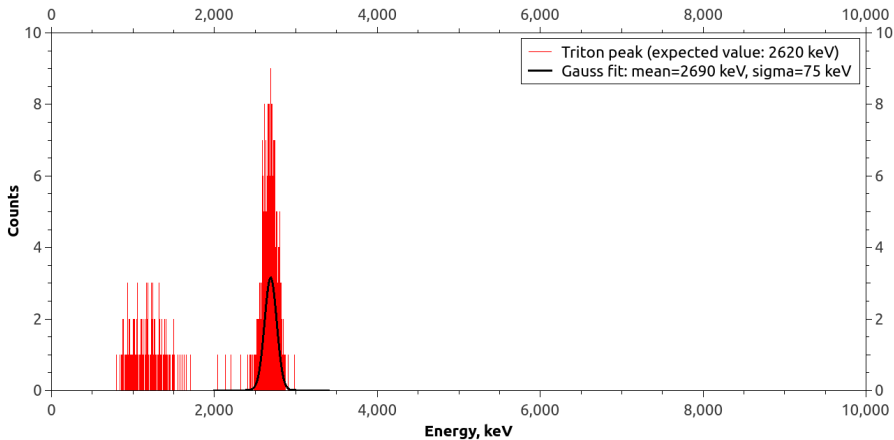
Measurement with ${}^6\text{LiF}$ foil converter



Pulse shape analysis applied to the measurement



Measurement with ${}^6\text{LiF}$ foil converter, triton peak



- Proton recoil spectrometer
- Experiments at ATi, TU Wien
- Pulse shape analysis

Acknowledgements

- **Prof. Erich Griesmayer** - for providing the equipment (diamond detectors, amplifiers, ROSY) and suggesting the pulse shape analysis methods
- **Prof. Paolo Finocchiaro** - for providing the lithium fluoride foil
- **Dr. Erwin Jericha** - for his help with the access to neutron sources at the ATi
- **Christina Weiss** - for consultations regarding the neutron measurements and the pulse shape analysis

Thank you!