

# Construction of a Neutron Ball for Exclusive Electron Scattering Experiments at the S-DALINAC\*



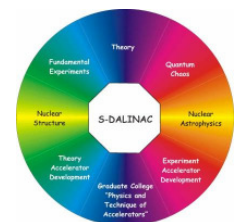
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- Motivation
- Experimental setup
- Experiments
- Results
- Summary and outlook

\*Supported by the DFG within SFB 634

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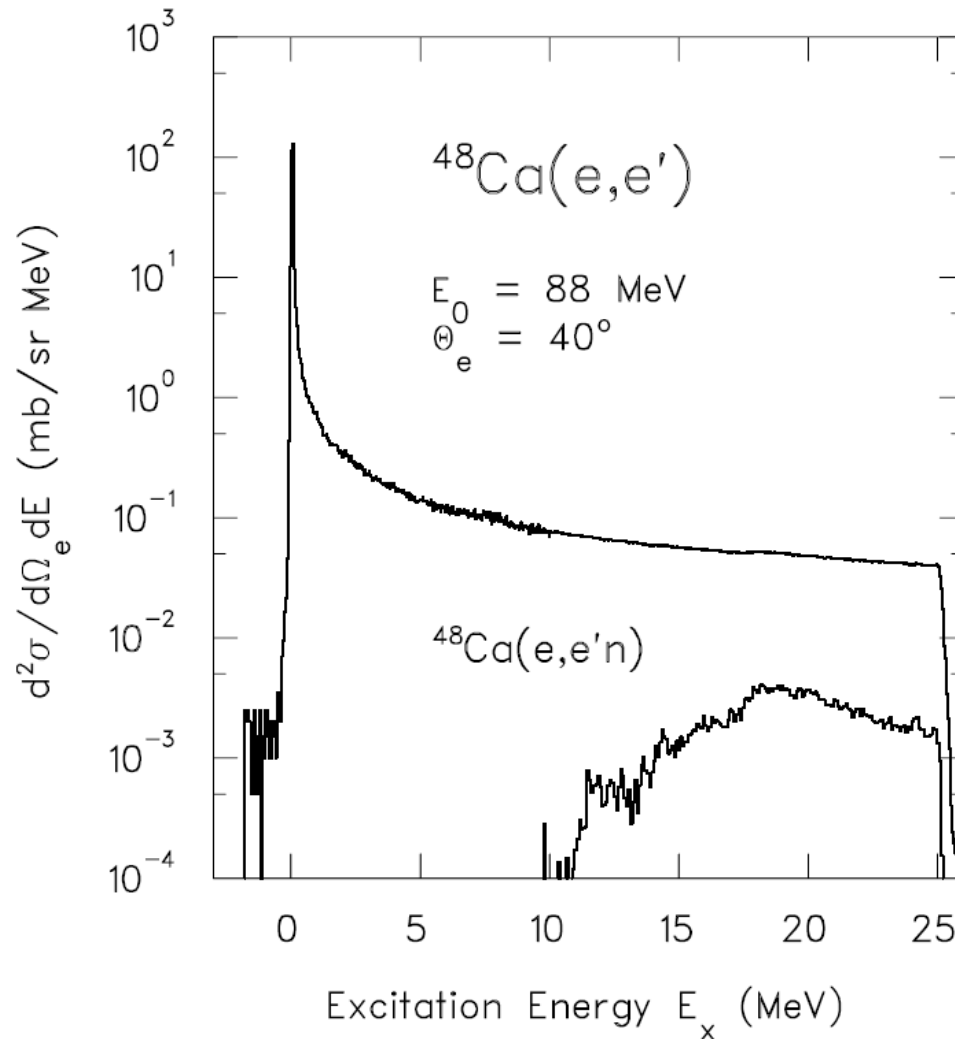


# Motivation

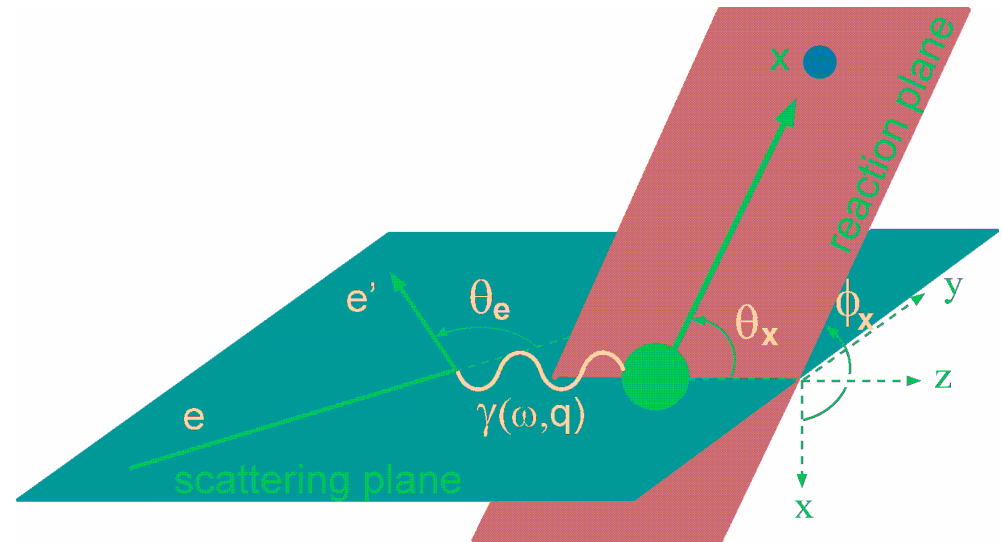
## Isoscalar Giant Dipole Resonance Measurements



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S.Strauch, Dissertation, TU Darmstadt (1998)



- exclusive electron coincidence measurements ( $e,e'n$ )
- almost background-free spectra
- suppression of the radiative tail
  - veto detector with a large solid angle

# Requirements for the Neutron Ball



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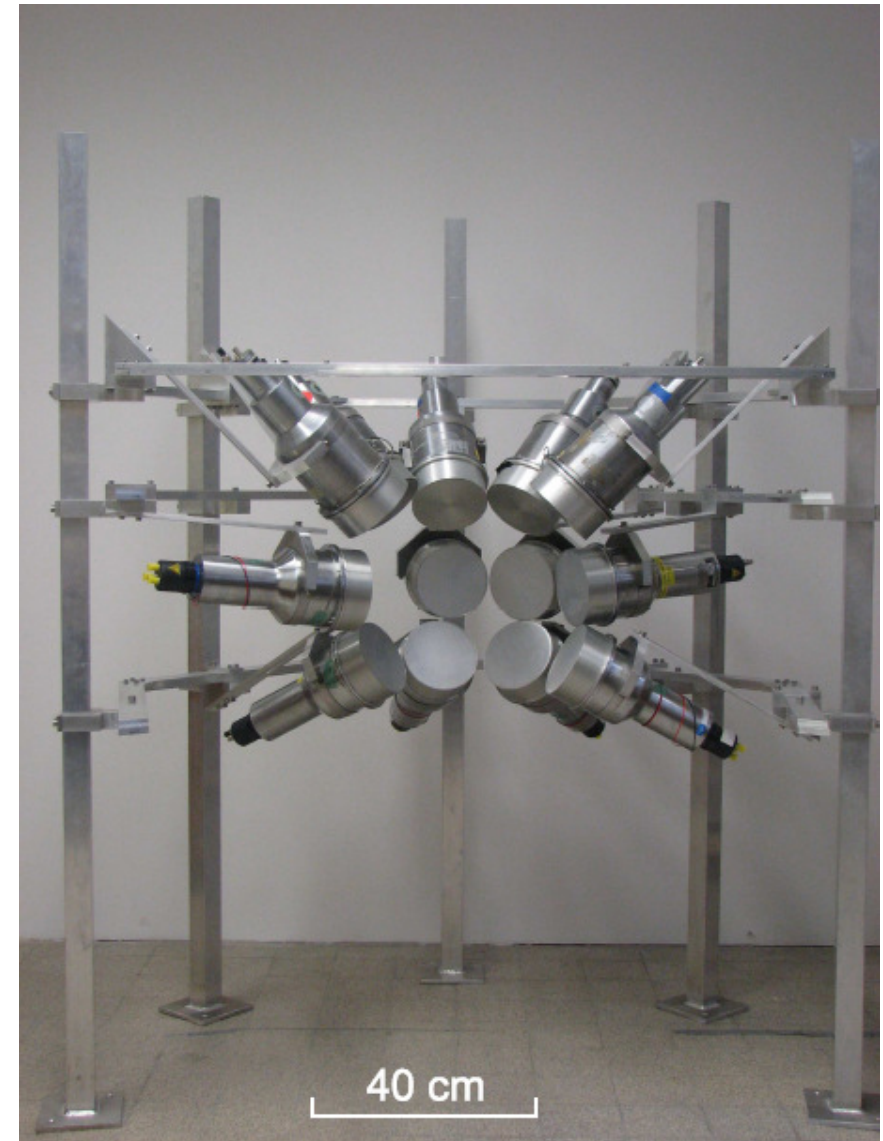
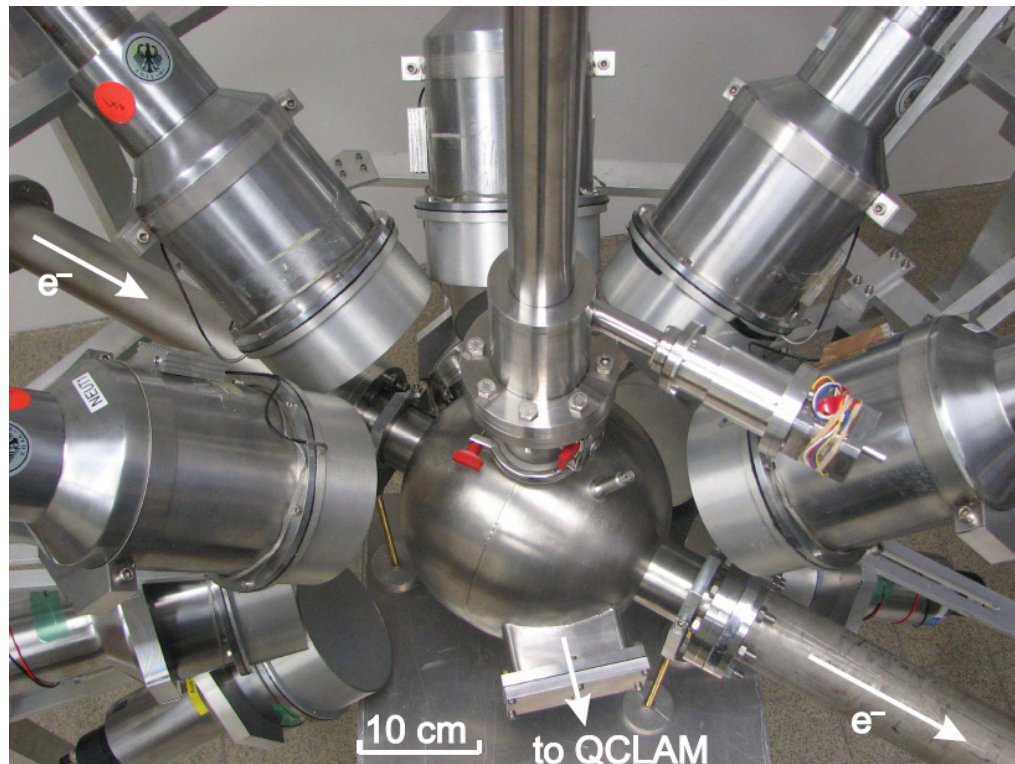
- fast detector response
- high neutron efficiency
- n/ $\gamma$ -discrimination
- compact geometry
- secondary: energy resolution

# Construction of the Neutron Ball



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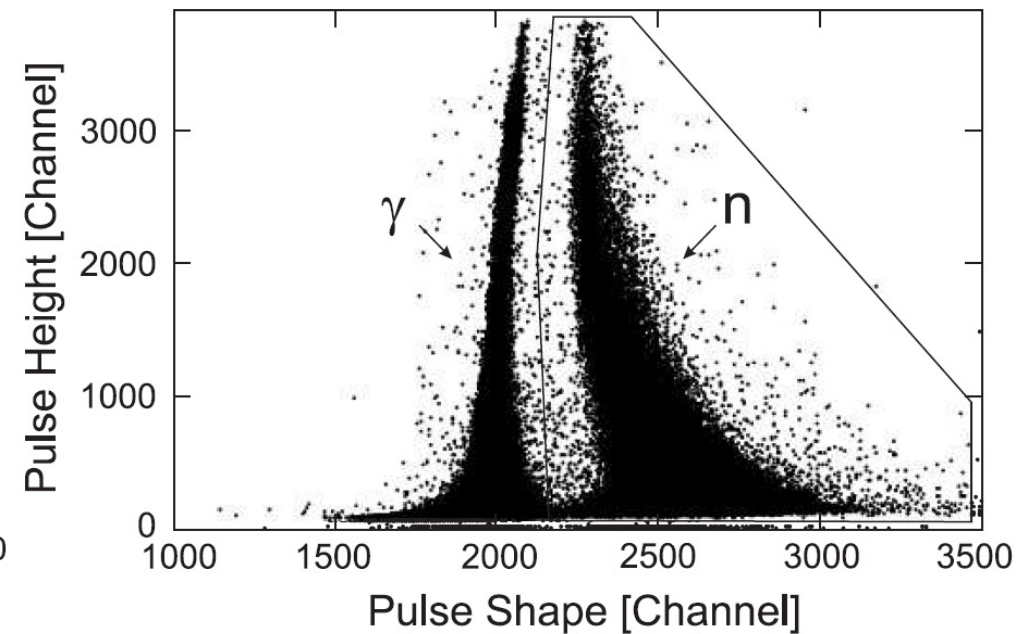
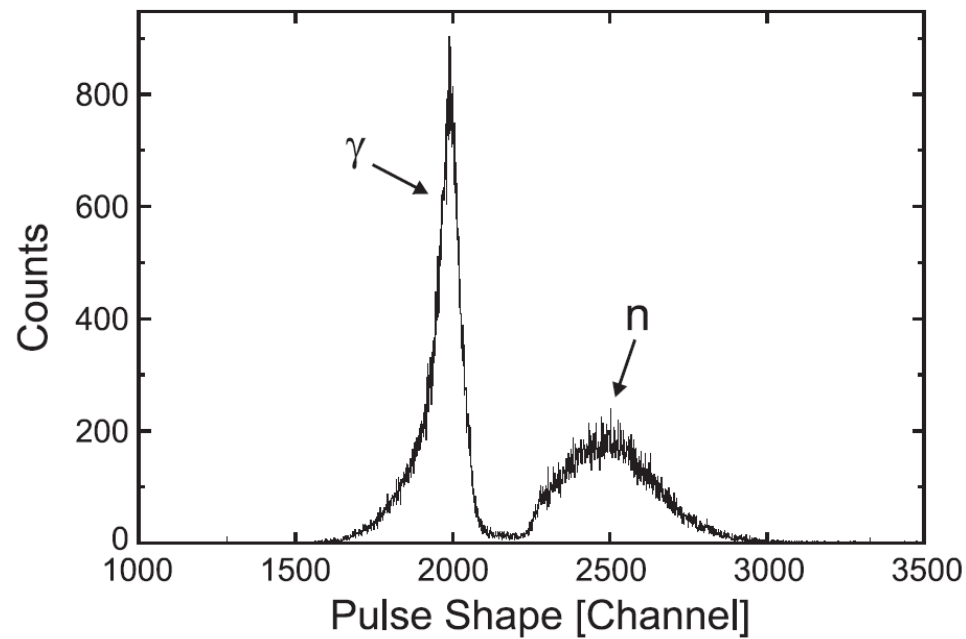
- 13 liquid scintillators of the type Bircon BC501A for neutron detection
- solid angle of about  $1.3 \pi$  (for 20 cm)



# Test of the Neutron Ball

## n/ $\gamma$ -Discrimination

- AmBe neutron source
- zero crossing method



# Test of the Neutron Ball

## Pulse-Height Calibration



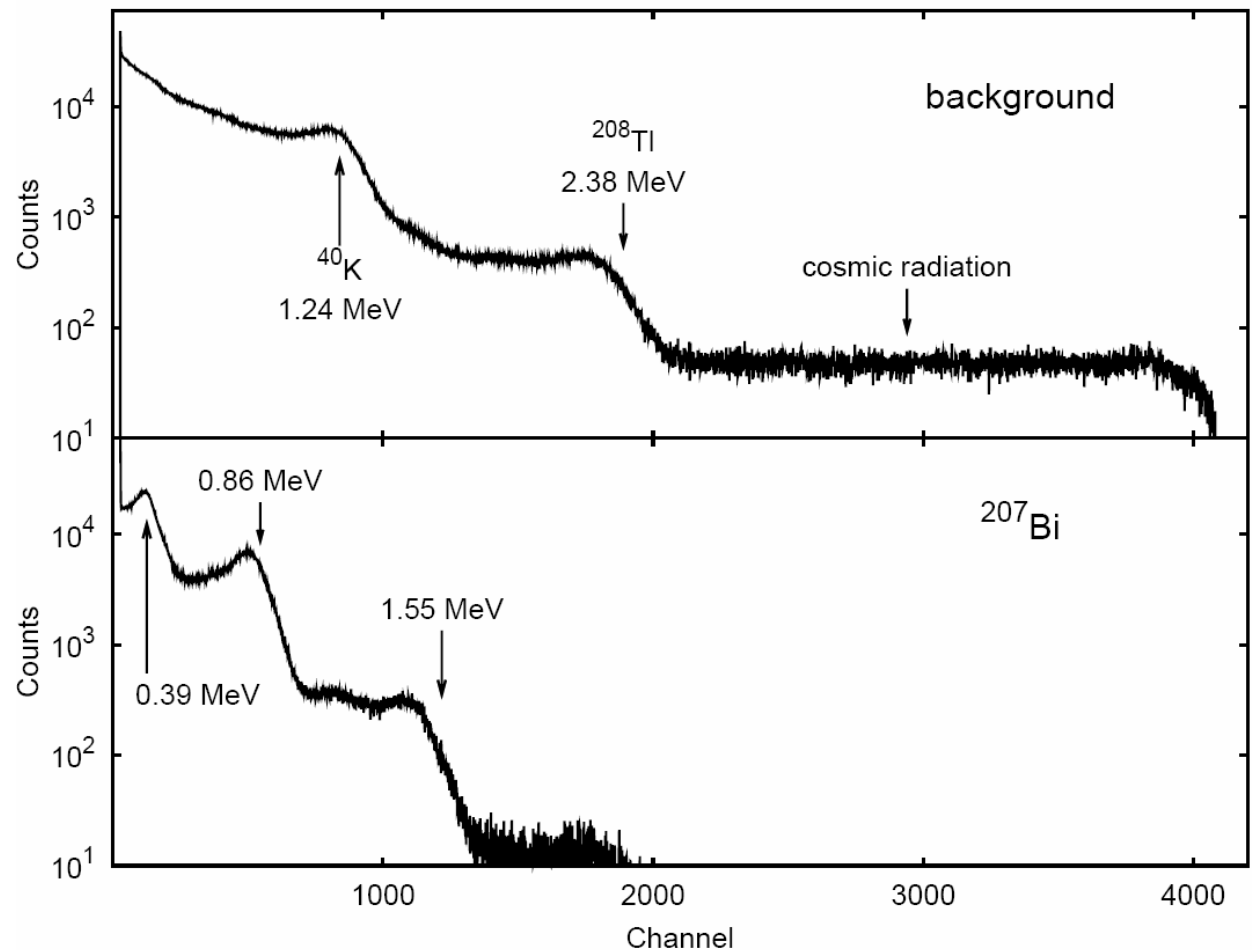
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measurement:

- (1) background
- (2) monoenergetic  $\gamma$  sources

analysis:

- (1) dead-time correction
- (2) background subtraction
- (3) unfolding starting from high energies



# Test of the Neutron Ball

## Unfolding of Measured Spectra



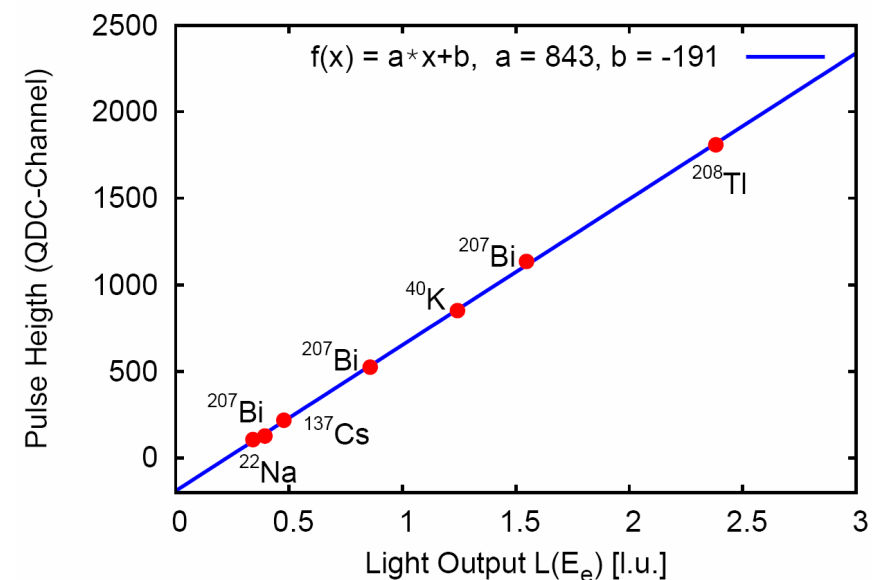
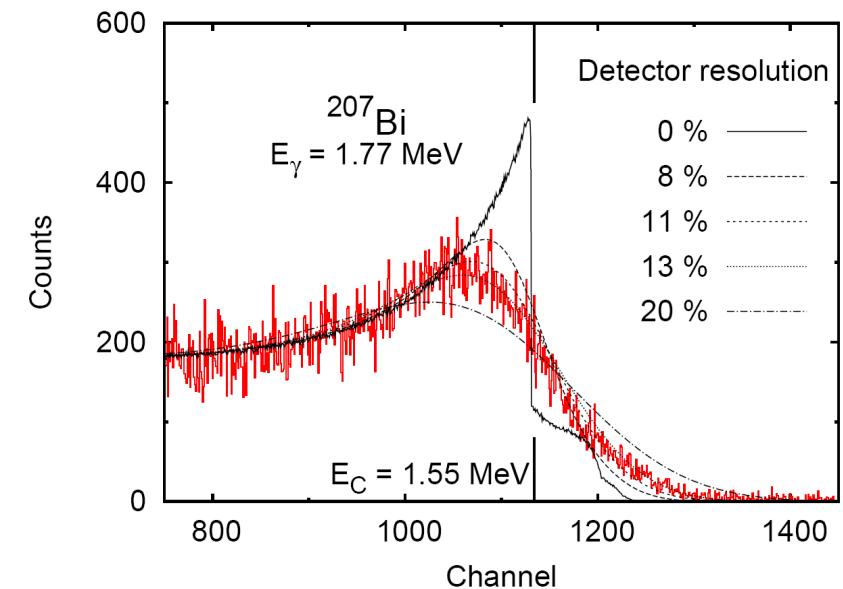
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procedure:

- pulse-height simulation NRESP
- folding with detector resolution
- fit to measured spectra

results:

- energy dependent detector resolution
- position of the compton edge
- pulse-height calibration



- ✓ design and construction finished
- ✓ tests performed
  - ✓ n/ $\gamma$ -discrimination
  - ✓ pulse-height calibration

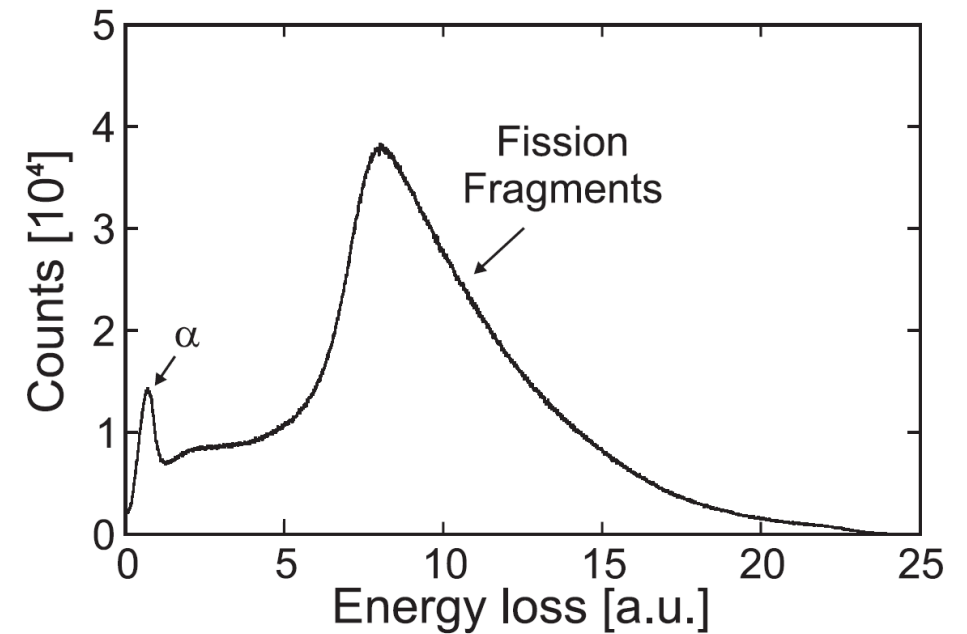
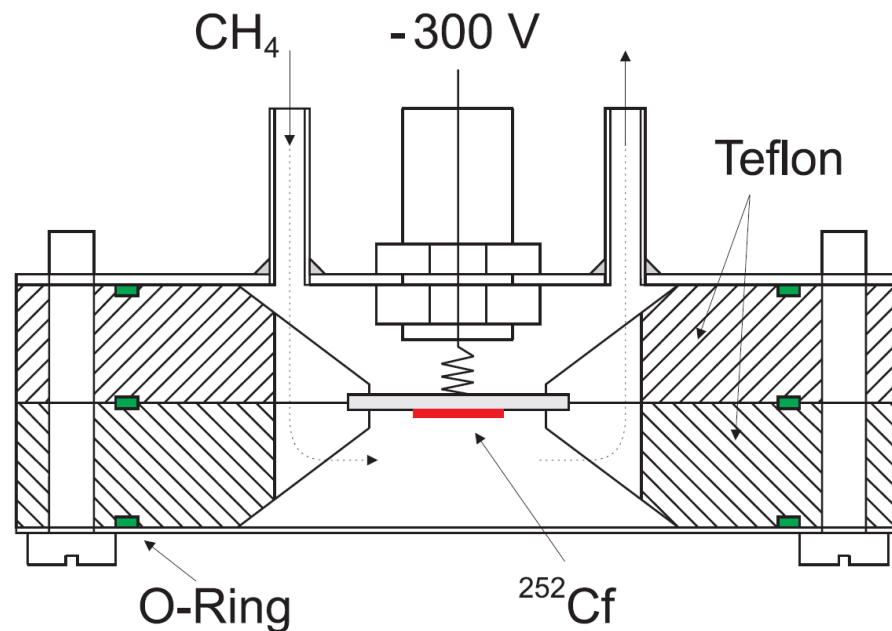


# Fission Chamber

Preparation for Efficiency Determination with  $^{252}\text{Cf}$



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- efficiency determination with  $^{252}\text{Cf}$ 
  - (1) ToF method
  - (2) single detectors
  - (3) whole setup
  - (4) simulations
  
- first measurements with heavy nuclei

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