Determination of the beam profile of the annihilation quanta from the 68Ge

- Method
- Setup
- Measurements
- Results
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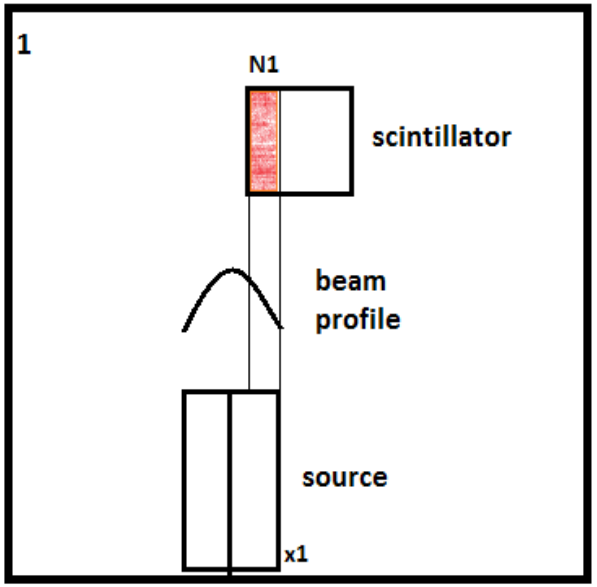
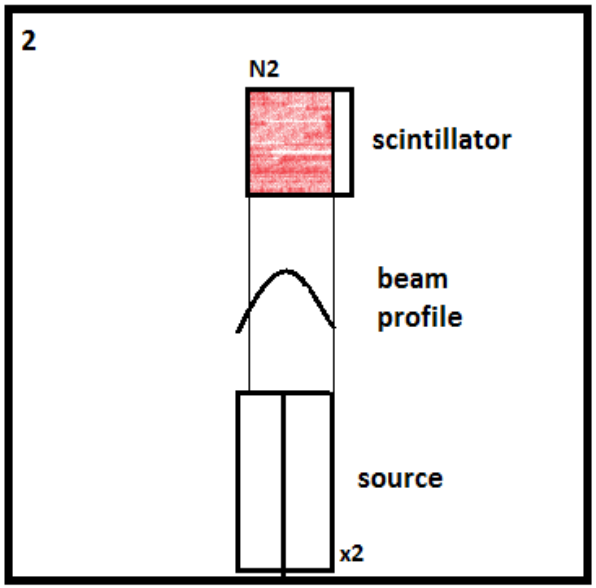
Method



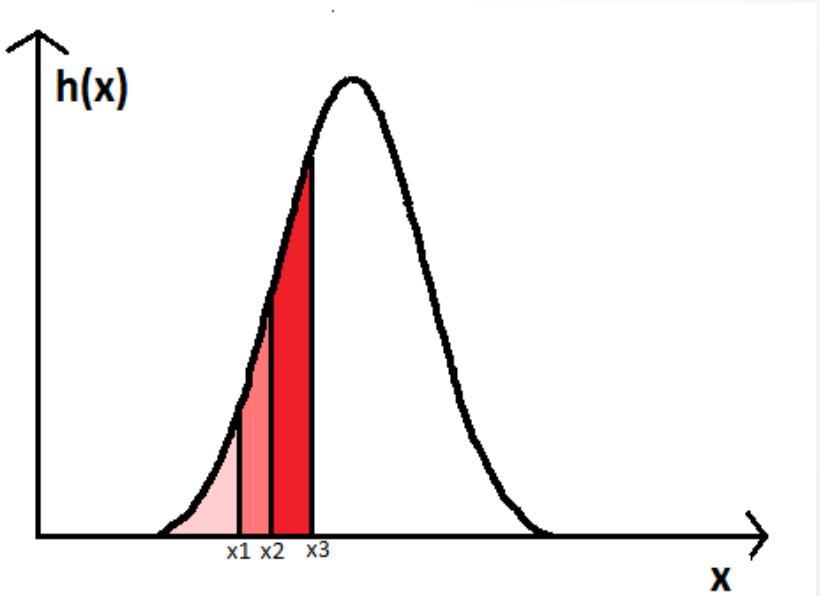
N1, N2 - number of counted accidents
x1, x2 - position of the source



- measurement of the number of counts registred by the setup
- small change of position x between measurements (~0.2 mm)
- calculation of diffrence in number of counts between consecutive steps

$$N2 - N1 = h(x)(x2 - x1)$$

$$h(x) = \frac{dN}{dx}$$



Method

M(x) – measured data
h(x) – estimated profile
g(x) – acceptance of the detector

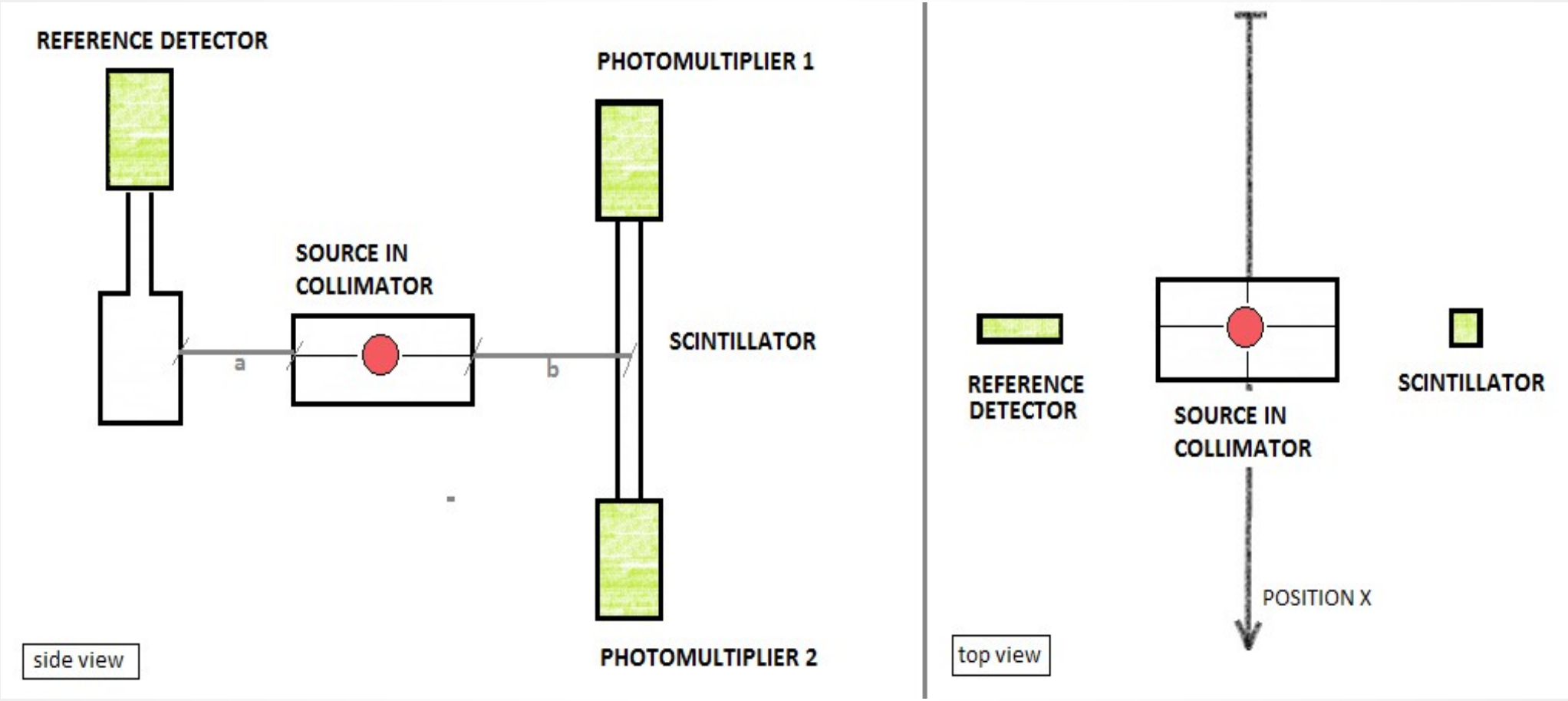
$$M(x) = h(x) * g(x) = \int_{\infty}^{\infty} h(x - x')g(x')dx'$$

$$g(x) = \begin{cases} 1 & \text{if } x \in [a, b] \\ 0 & \text{if } x \notin [a, b] \end{cases}$$

$$M(x) = h(x) * g(x) = \int_{a}^{b} h(x - x')dx'$$

$$\frac{d}{dx}M(x) = h(x - b) - h(x - a)$$

Setup



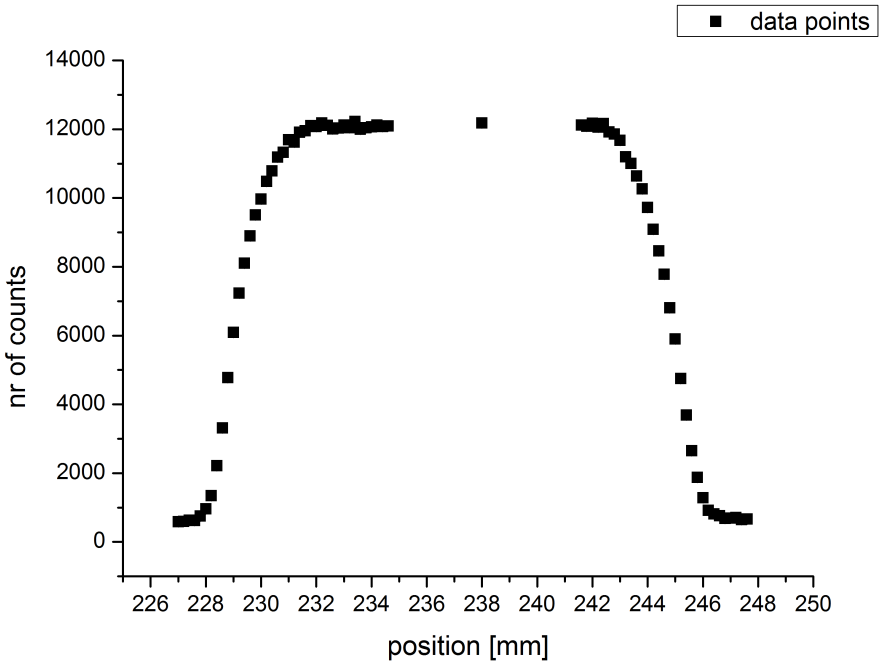
Measurements were made for diffrent distance between collimator and scintillator and between collimator and reference detector. After the first 3 measurements the frame was strengthened. The setup was **working in coincidence**, if there was a signal on the reference detector the signal on photomultipliers 1 & 2 were registered.

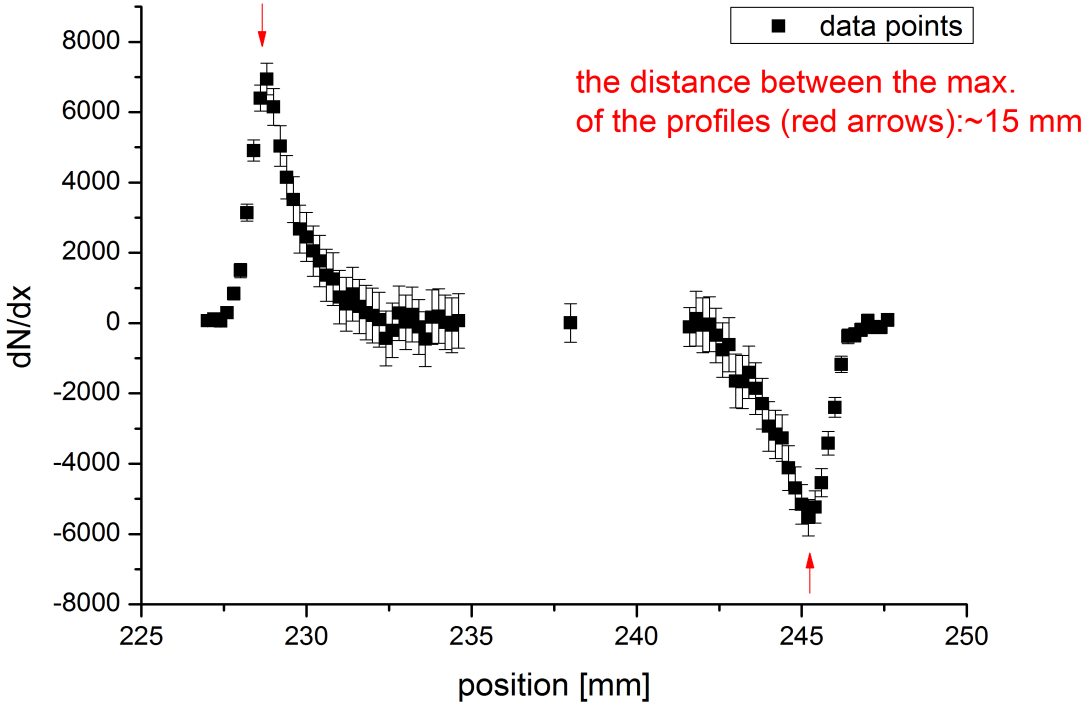
Measurements

Measurements for 6 diffrent setup settings were performed:

1. **a**=17.7 cm, **b**=10.3 cm, **x**: 256.0 mm – 230.0 mm (2min)
2. **a**=17.7 cm, **b**=29.2 cm, **x**: 239.0 mm – 229.0 mm (5min)
3. **a**=17.5cm, **b**=10.5 cm, **x**: 242.0 mm – 247.8 mm (4min)
4. **a**=6 cm, **b**=8.9 cm, **x**: 249.6 mm – 240.4 mm (4min)
5. **a**=10 cm, **b**=7.8cm, **x**: 248.0 mm – 227.0 mm (4min)
6. **a**=35 cm, **b**=7.8 cm, **x**: 244.4 mm – 238.6 mm (4min)

Results



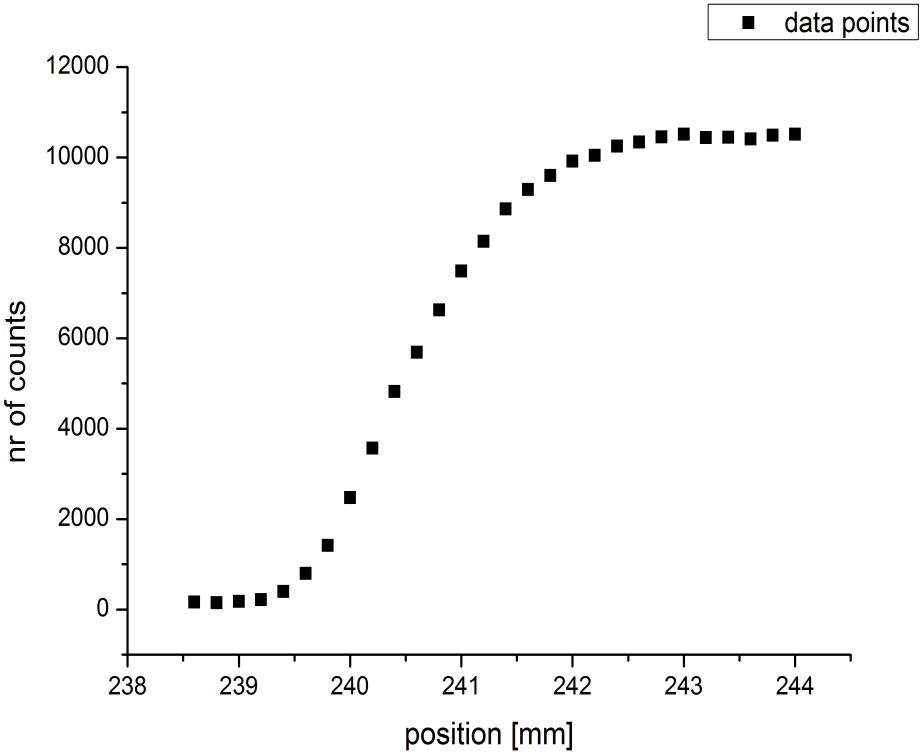


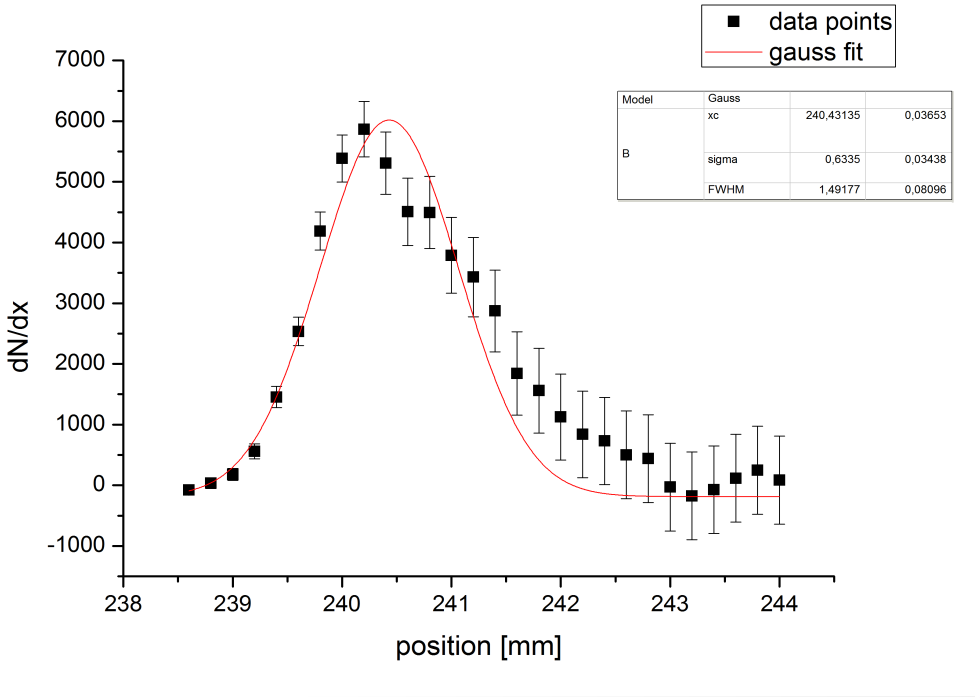
left: measured data

right: derived curve (profile)

FWHM a=1.26 mm, b=1.68 mm

Results





left: measured data

right: derived curve (profile)

FWHM 1.49 mm

Difficulties

- Precision of the settings
- Recurrence of the results (The results were better if the measurement was continous and uninterrupted)
- Before the setup frame was strengthened the position of the reference detector while moving the collimator was unsure.

Thank you for attention