

The Nuclear Fuel Cycle, Lab

In the first part of the laboratory activities, the assistant will demonstrate different detectors for measuring ionizing radiation. In the second part the students are supposed to work more or less without supervision. Prepare by considering how the task shall best be performed.

The following text describes how the laboratory experiments are to be performed. Read in the textbook about how the different detectors work in general.

- (8.2.3) *Pulse shape and dead time* 202-204
- 8.3 *Gas counters* 204-206
- 8.3.3 *GM-counters* 210-211
- 8.4 *Semi-conductor detector* 212-213, 215-217
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- 8.7.6 *γ -spectroscopy* 226-228

Ion chamber / Geiger-Müller counter

Three different Geiger-Müller counters will be demonstrated

- Determine the β_{\max} of a sample by first determining the half-thickness of an absorber (see appendix)
- Determine the measuring efficiency of the detector for β - and γ -radiation. Assume that the detector is working in the ion chamber region (even though it's not)
- Remember to take the background into account.

Scintillation detector

- Determine the activity [Bq] of a sample. A solution with known specific activity will be provided for the isotope.

Multi-channel analyzer

- Record the spectrum of Eu-152
- Determine the measuring efficiency of the detector at three different energies, using data for Eu-152 provided in the appendix.

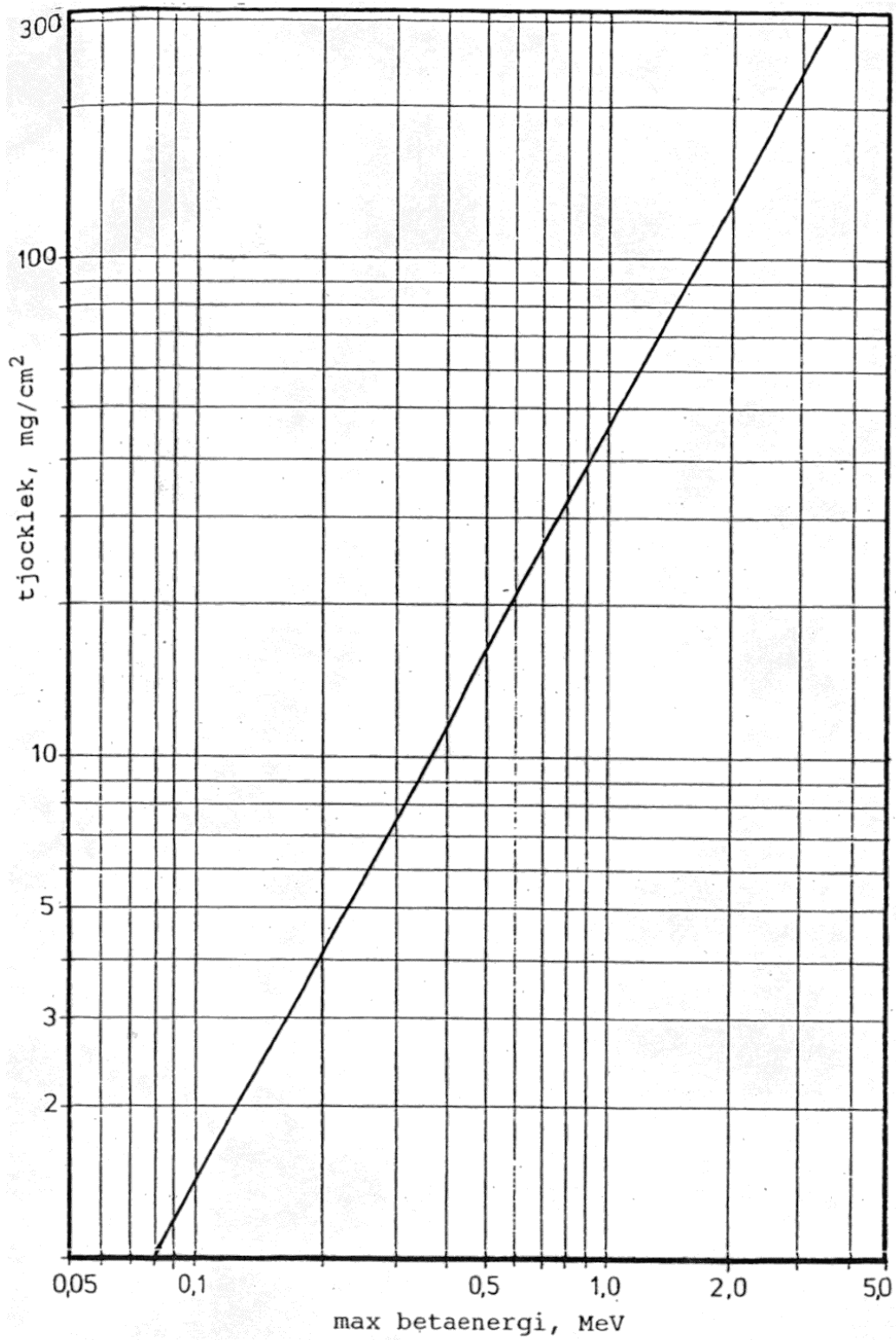


Fig. 6 Halveringstjockleken för betapartiklar som funktion av energin

Référence Multigamma ^{152}Eu
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Source étalon type EGMA 2

N° 5179

Date de référence: le 05.09.1977

à 12 h 00⁽¹⁾

ENERGIE ⁽²⁾ KeV	Taux d'émission photonique ⁽³⁾ $\frac{\gamma}{\text{mg}/4\pi}$	Incertitude ⁽⁴⁾ %
121,78 ± 0,02	$1,168 \cdot 10^4$	2,4
244,69 ± 0,02 251,76 ± 0,08	244,7 ⁽⁵⁾ $3,072 \cdot 10^3$	2,6
295,94 ± 0,03	$1,751 \cdot 10^2$	3,7
344,28 ± 0,02	$1,093 \cdot 10^4$	2,1
367,76 ± 0,03	$3,479 \cdot 10^2$	4,2
411,12 ± 0,02 416,04 ± 0,07	411,3 ⁽⁵⁾ $9,524 \cdot 10^2$	3,1
443,98 ± 0,02 444,00 ± 0,10	444,0 ⁽⁵⁾ $1,273 \cdot 10^3$	2,2
564,02 ± 0,04 566,36 ± 0,08	564,5 ⁽⁵⁾ $2,538 \cdot 10^2$	6;1.
686,4 — 688,69 ± 0,08	688,6 ⁽⁵⁾ $3,516 \cdot 10^2$	3,5
778,90 ± 0,03	$5,383 \cdot 10^3$	2,3
867,38 ± 0,03	$1,723 \cdot 10^3$	2,0
963,43 ± 0,08 964,05 ± 0,03	964,0 ⁽⁵⁾ $5,996 \cdot 10^3$	2,2
1085,83 ± 0,03 1089,72 ± 0,04	1086,4 ⁽⁵⁾ $4,903 \cdot 10^3$	2,7
1109,2 — 1112,08 ± 0,04	1112,0 ⁽⁵⁾ $5,611 \cdot 10^3$	2,1
1212,94 ± 0,04	$6,048 \cdot 10^2$	2,8
1292,86 ± 0,07 1299,13 ± 0,04	1298,7 ⁽⁵⁾ $7,218 \cdot 10^2$	3,6
1408,03 ± 0,03	$8,571 \cdot 10^3$	2,0

