

Introduction to KF3 α Spectroscopy

Supervisor:

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The lab:

Starting 8.30 in H212.

Main tasks:

- Calibrate the detector.
- Measure ^{224}Th alpha decay energies and intensities.
- Compare with theory (calculated).

Bring:

- Lab manual with all attachments
- Krane Book
- Calculator/laptop
- USB stick (one person per group)

Preparations before the lab:

- Krane 7.4 on semiconductor detectors
- Krane 7.6, very first section on setup
- Krane 8, on alpha decay

The decay probabilities are predicted by a theory: the Gamow theory for alpha emission. This is described in Krane 8.4. Read this thoroughly to understand the preparatory exercise and how to solve it!

The task is to calculate the Gamow factor, G , for the two decays of ^{228}Th , to the 0^+ state (ground state) and 2^+ (first excited state, $E_x = 84.4 \text{ MeV}$) of ^{226}Ra . This is done using the evaluated expression, valid for $V(r)$ and $V_{Coulomb}(r)$, given by eq. 8.17 in Krane. Few things to remember: b is defined via Q , the nuclear radius can be related to the mass number A (Mind the units!). Krane book contains constants in convenient units for nuclear physics (e.g. $\text{MeV}\cdot\text{fm}$, etc.). It is also convenient to set $c \equiv 1$, etc.

Report:

Reports should be in .pdf. The deadline for handing in the reports is 10 working after the laboratory has been conducted.

Please send the finished reports to Edgar.Kellermann.lu@analys.urkund.se