

Study of the  $\alpha$ -energies of  $^{226}\text{Ra}$  5.2.23-01/11/15

## Set-up of experiment P2522311 with Cobra3



## What you can learn about ...

- Decay series
- Radioactive equilibrium
- Isotopic properties
- Decay energy
- Particle energy
- Potential well model of the atomic nucleus
- Tunnel effect
- Geiger-Nuttal law
- Semiconductor
- Barrier layer

## Principle:

An  $\alpha$ -spectrometer, consisting of a silicon surface barrier layer detector, a preamplifier, a pulse height analyzer and a recording device for registration of the spectra is calibrated by means of an open  $\alpha$ -emitter of known  $\alpha$ -energy ( $^{241}\text{Am}$ ).

The energy spectrum of a radium source which is in equilibrium with its decay products, is recorded and



## What you need:

## Experiment P2522315 with MCA

## Experiment P2522311 with Cobra3

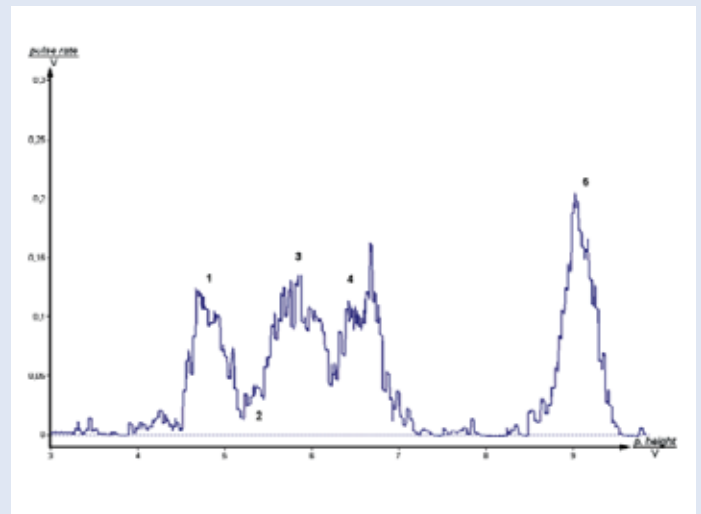
## Experiment P2522301 with xyt recorder

Multi-Channel-Analyzer	13726.99			1
Software Multi-Channel-Analyzer	14452.61			1
Alpha- and Photodetector*	09099.00	1	1	1
Americium-241 source, 3.7 kBq	09090.03	1	1	1
Adaptor for radioactive sources	09043.29	1	1	1
Radioactive Source Ra-226, 4 kBq	09041.00	1	1	1
Container for nuclear physics experiments	09103.00	1	1	1
Pre-amplifier for alpha detector	09100.10	1	1	1
Pulse height analyser	13725.93	1	1	
XYt recorder	11416.97			1
Hand held measuring instrument Pressure, RS 232	07136.00	1	1	1
Pressure sensor, 1.0...1300 hPa	07136.01	1	1	1
Diaphragm pump, two stage, 220V	08163.93	1	1	1
Rubber tubing/vacuum, $d = 6$ mm	39286.00	3	3	3
Tubing connect., Y-shape, $d = 8-9$ mm	47518.03	1	1	1
Oscilloscope 30 MHz, 2 channels	11459.95	1	1	
Pinchcock, width 20 mm	43631.20	1	1	1
Screened cable, BNC, $l = 750$ mm	07542.11	4	4	4
Connecting cable, 4 mm plug, 32 A, red, $l = 75$ cm	07362.01	2	2	
Connecting cable, 4 mm plug, 32 A, blue, $l = 75$ cm	07362.04	2	2	
Data cable 2 x SUB-D, plug/socket, 9 pole	14602.00	1	1	1
Cobra3 BASIC-UNIT	12150.00			1
Software Cobra3 Universal recorder	14504.61	1		
Power supply 12V/2A	12151.99	1		
PC, Windows® 95 or higher				

## \* Alternatively:

Alpha detector	09100.00	1	1	1
Cable connector BNC, 50 $\Omega$	07542.09	1	1	1

Complete Equipment Set, Manual on CD-ROM included  
Study of the  $\alpha$ -energies of  $^{226}\text{Ra}$  P25223 01/11/15



$^{226}\text{Ra}$  pulse rate dependence of pulse height.

evaluated. The  $\alpha$ -energies found in this way are allocated to the corresponding nuclides of the radium decay series.

## Tasks:

- The  $\alpha$ -spectrum of the  $^{226}\text{Ra}$  is recorded, the settings of the pulse analyzer (amplification) and recorder ( $x$  and  $y$  input sensitivity) being selected so as to make best possible use of the recording width.
- The calibration spectrum of the open  $^{241}\text{Am}$ -emitter is recorded at the same settings.
- The  $\alpha$ -energies corresponding to the individual peaks of the  $\alpha$ -spectrum of the radium are calculated and, on the assumption of a constant energy loss in the source covering, the  $\alpha$ -active nuclides of the radium decay series corresponding to the individual peaks are determined on the basis of the values in the literature.