

Detection and properties of radioactive radiation

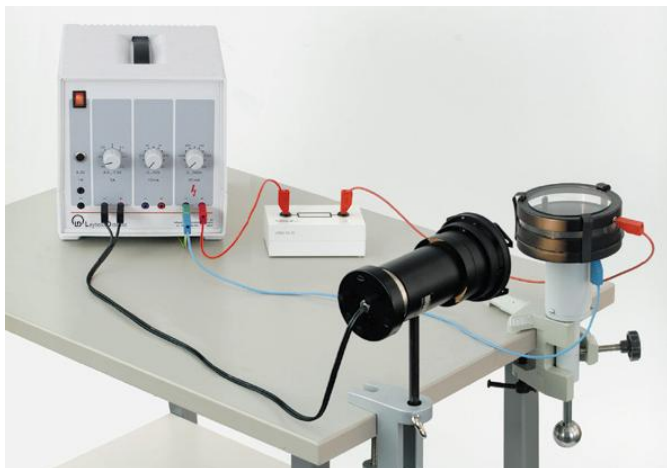
Detecting radioactive radiation

Detecting alpha radiation

Object of the experiment

1. Demonstrating the trajectories of α particles in a Wilson cloud chamber

Setup



Preparing the alcohol-water mixture:

- Mix 50 ml of ethanol and 50 ml of distilled water in the graduated cylinder, fill the mixture into the polyethylene bottle, and close the bottle.

Setting up the illumination:

- Set up the lamp housing with the incandescent lamp at a distance of about 15 cm from the Wilson chamber so that the chamber is illuminated along the expected trajectories of the α particles.
- Connect the lamp to the transformer.
- Align the filament of the lamp horizontally by turning the lamp insert, and adjust a parallel or slightly divergent light bundle.

Preparing the Wilson chamber:

- Open the lid of the chamber by loosening the holding clips, and take the bottom plate out.
- Check whether the chamber is free of dust, and, if necessary, wipe it out with distilled water.
- Using the dropper, drip ethanol-water mixture onto the felt cover of the bottom plate until it is slightly moistened.
- Put the bottom plate with the feet on the rubber gasket. See to it that the rubber gasket evenly rests on the edge of the bottom of the chamber.
- Heeding the safety regulations (see instruction sheet 559 59), take the Radium source for Wilson chamber out of the glass container, and insert it in the holder for preparations in the bottom plate.
- The rubber gasket being correctly seated, cover the Wilson chamber with the lid and close the holding clips.
- Check whether the chamber is sealed by running the air drain pump. If the resistance is weak or if a rustle is heard during expansion, the chamber is not sealed. In this case, grease the gasket with vacuum grease or with a drop of viscous oil.
- Apply a direct voltage of approx. 150 V for deionizing the chamber.
- After closing the chamber, wait for some ten minutes until the experiment is carried out for the first time in order that a saturated mixture of air, water vapour, and ethanol vapour can form.

Apparatus

1 Wilson cloud chamber.....	559 57
1 Ra-226 radium source for Wilson chamber, 5 kBq....	559 59
1 Lamp housing with cable.....	450 60
1 Condensor with diaphragm holder.....	460 20
1 Bulbs, 6 V/30 W, E14, set of 2.....	450 511
1 Measuring resistor, 100 k Ω	536 251
1 Tube power supply, 0...500 V.....	521 65
1 Connecting leads, 19 A, 100 cm, red/blue, pair	501 46
1 Connecting lead, 19 A, 25 cm, red	500 411
1 Simple bench clamp.....	301 07
1 Bench clamp	301 06
1 Ethanol, denaturated, 1 l	671 9720
1 Water, pure, 5 l	675 3410
1 Polyethylene bottle.....	661 222
1 Measuring cylinder, 100 ml, with plastic base.....	665 754
1 Dropper, 7 x 150 mm, 10 pcs.	665 953
1 Rubber bulbs, 10 pcs.	665 954

Recommended for better visibility:

- 1 BMS EcoCam III video and USB cameraMIK74703

Carrying out the experiment

- Pull the handle of the air drain pump down in one go, keep it in its final position, and observe the tracks of droplets left behind by the particles. Look into the chamber immediately from above through the window.

The experiment can be repeated after approximately 2 minutes.

Evaluation

The tracks of the particles are visible as in the picture:

