

Experiment 9 Wilson Chamber

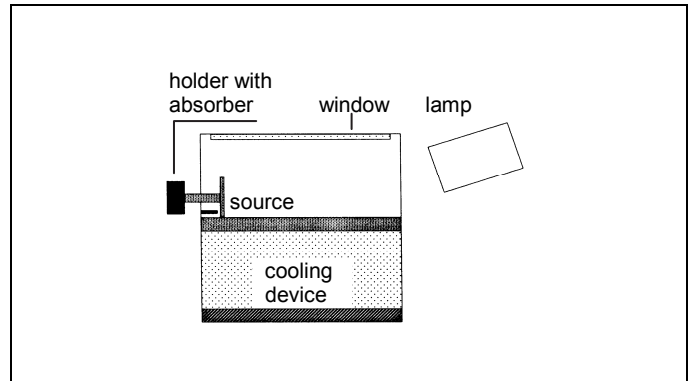
Name:

Aim

To observe the condensation trails caused by α and β particles emitted by a source of radium-226 and its decay products.

Set-up

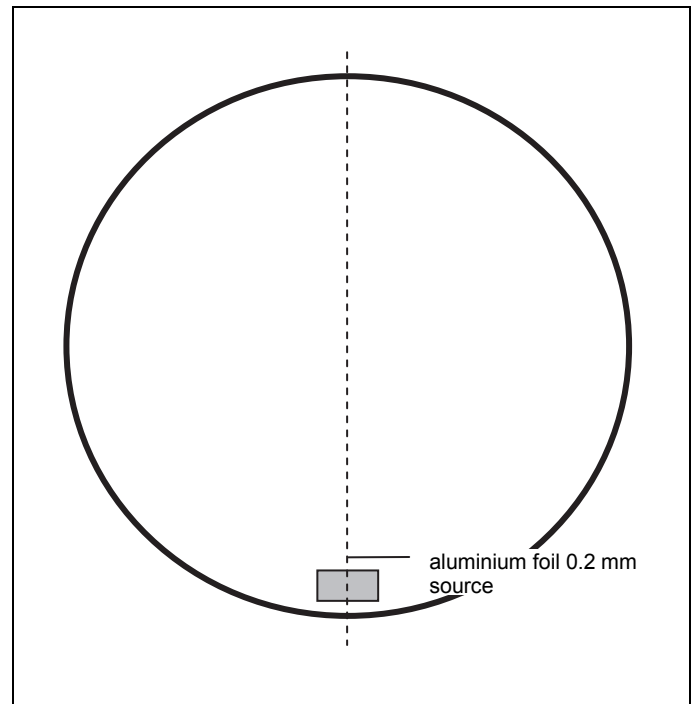
The set-up consists of a continuous Wilson chamber with a source of radium-226 (^{226}Ra). This source can be shielded with aluminium foil (thickness 0.2 and 4 mm) in a holder inside the Wilson chamber. A lamp on the outside is used to illuminate the inside of the Wilson chamber.



Read the introduction on page 11 of the booklet *ISP Experiments* about the operation of the Wilson chamber and the emergence of condensation trails caused by α and β particles.

Observations

- 1 Make sure there is no aluminium foil between the source and the chamber. In the chamber you will now see clear straight condensation trails caused by particles emitted by the source. Every now and then you will also see a condensation trail in a different and arbitrary direction, caused by a particle that clearly has not been emitted by the source.
- 2 By turning the button, position the 0.2 mm aluminium foil between the source and the chamber. The clear straight condensation trails have now disappeared. When you look into the light under an angle you will see very thin 'spider web-like' condensation trails caused by particles emitted by the source.
- 3 By turning the button, position the 4 mm aluminium foil between the source and the chamber. Do you now see any condensation trails?
.....



- 4 In the figure above, make a drawing of the two kinds of observed condensation trails in the Wilson chamber. On the left you can draw the situation without shielding, on the right the situation with shielding by 0.2 mm aluminium foil.

Assignments

- 1 The source emits α , β and γ radiation. In the drawing above, indicate which kind of condensation trail corresponds to which kind of radiation.
- 2 Explain how the condensation trails in the Wilson chamber originate.
.....
.....
.....
.....

3 The condensation trails of the α particles have a range of only a few cm. Explain this.

.....
.....

4 The condensation trails of the α particles have different lengths. Explain this.

.....
.....

5 What happens to an α particle when it has lost all its kinetic energy?

.....
.....

6 When the source is shielded by 0.2 mm aluminium foil, the condensation trails of the α particles will have disappeared and the condensation trails visible are those of the β particles. Explain this.

.....
.....

7 The condensation trails of the β particles are far less clearly visible as compared to the condensation trails of the α particles. Explain this.

.....
.....

8 When the source is shielded by 4 mm aluminium foil, also the condensation trails of the β particles will have disappeared. Explain this.

.....
.....

9 In the Wilson chamber, every now and then, you can observe some kind of random condensation trails, clearly not originating from the source of radium-226. What is the source of these condensation trails?

.....
.....

10 Explain why γ radiation doesn't cause any visible condensation trails in the Wilson chamber.

.....
.....