# Deflection of electron beams in a magnetic field

Perrin tube and permanent magnet



## Object of the experiment

1. Investigating the deflection of electron beams in the magnetic field of a permanent magnet

## Setup

Safety note:

The Perrin tube can be destroyed by incorrect connection and by voltages and currents that are too high. Regarding the connection and technical data heed the instruction sheet 555 622.

## Apparatus

| | |
|---|---|
| 1 Perrin tube | 555 622 |
| 1 tube stand | 555 600 |
| 1 pair of magnets | 510 48 |
| 1 high-voltage power supply 10 kV | 521 70 |
| 1 safety connecting lead, 100 cm, red | 500 641 |
| 1 safety connecting lead, 100 cm, blue | 500 642 |
| 2 safety connecting leads, 100 cm, black | 500 644 |
| 2 safety connecting leads, 25 cm, red | 500 611 |

## Carrying out the experiment

Remark:

The north magnetic pole of the magnet is located at the face marked with red paint.

- Switch the high-voltage power supply on, and enhance the voltage until the luminous spot of the electron beam is visible on the screen of the Perrin tube.
- Bring the north magnetic pole of the magnet from the left to the screen of the tube, and observe the deflection of the electron beam.
- Repeat the experiment with the south magnetic pole of the magnet.
- Bring the north magnetic pole of the magnet from below to the screen, and observe the deflection of the electron beam.
- Repeat the experiment with the south magnetic pole of the magnet.

## Observation

| Direction of the magnetic field | Direction of the deflection of the electron beam |
|---|---|
| → | ↓ |
| ← | ↑ |
| ↑ | ← |
| ↓ | → |

## Evaluation

If electrons move perpendicularly to a magnetic field, a force acts on them, which is called Lorentz force.

The action of the Lorentz force is seen by the deflection of the electron beam from the centre of the screen.

The direction of the Lorentz force depends on the direction of the magnetic field.



LEYBOLD DIDACTIC GMBH · Leyboldstrasse 1 · D-50354 Hürth · Phone (02233) 604-0 · Fax (02233) 604-222 · e-mail: info@leybold-didactic.de