

Phenomena of electrical conduction

Conduction phenomena in the vacuum

Linear propagation and deflection of electron beams

Maltese cross tube

Objects of the experiments

1. Demonstrating the linear propagation of electron beams
2. Demonstrating the deflection of electron beams in a magnetic field

Setup



Safety note:

The Maltese cross 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 555 610.

Apparatus

1 Maltese cross tube.....	555 620
1 tube stand.....	555 600
1 high-voltage power supply 10 kV.....	521 70
1 large horseshoe magnet with yoke.....	510 22
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
1 safety connecting lead, 50 cm, red.....	500 621
1 safety connecting lead, 25 cm, red.....	500 611

Carrying out the experiment

- Switch the cathode heating on, observe the screen, and slowly enhance the anode voltage up to 4.5 kV.
- Bring the magnet to the tube from the side, and observe the change of the image.

Observation

After the cathode heating has been switched on, the shadow of the cross is seen on the screen of the tube.

When the anode voltage is enhanced, a second shadow appears on the screen, which coincides with the first shadow.

When the magnet is brought to the screen, the shadow image is distorted.

Evaluation

Light propagates in a straight line. Therefore a shadow of the cross appears on the screen when the cathode heating is switched on.

When an anode voltage is applied, electrons are accelerated towards the screen.

Some of the electrons impinge on the cross, and a second shadow is seen on the screen. The fact that this shadow coincides with the first one demonstrates that the electron beams propagate in a straight line exactly in the same way as light.

Electron beams can be deflected by a magnetic field.