

Option: Arts

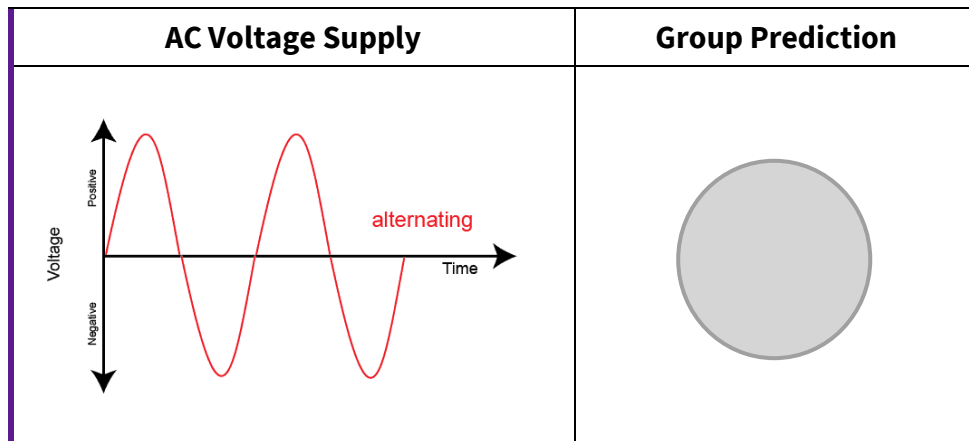
Goal: Create artists' impressions of Lissajous figures using an electron beam.

1. Investigate effect of AC electromagnet on e-beam and deflect the e-beam with an electric field.



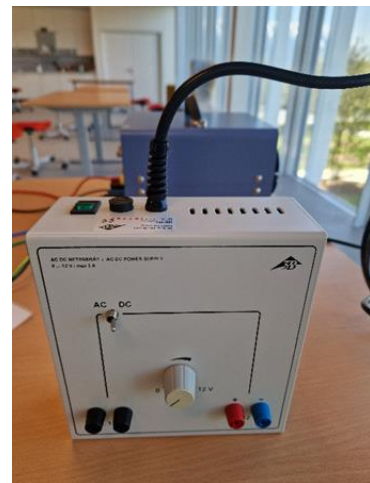
Prediction

Mark your prediction for the beam profile when electromagnet is connected to AC:



Task

- Set up electron beam to hit the centre of the screen.
- Get second power supply, turn knob to zero and switch to AC.
- Attach cables to black receptors.
- Turn on second power supply as before.



Observation

Did your observations match your predictions?

- Now set up electron beam to hit left side of the screen (use the ring magnet).
- On the **electron tube control panel (shown on right)**, turn frequency to lowest setting on bottom. Turn on the sawtooth voltage.
- Turn the bottom knob to increase the frequency - are the electrons stationary?



Play around with different settings to see what else changes.

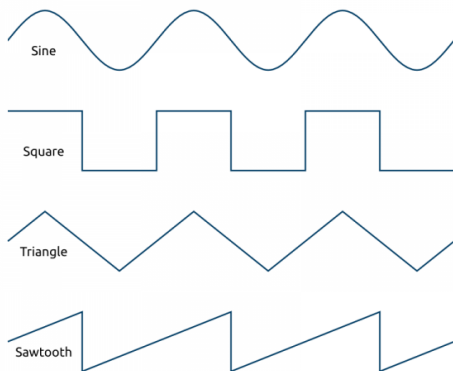


Switch off the second power supply after you are done.



Explanation

Did you know? A sawtooth voltage (sometimes called ramp voltage) is a voltage that rises in a straight line until some value and then drops to zero volts immediately.



Different voltage profiles

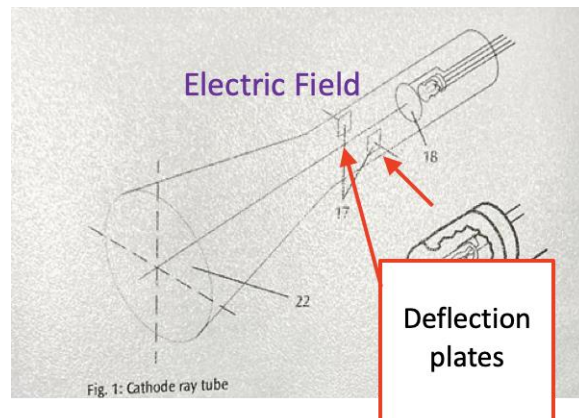


Diagram showing where the sawtooth voltage is applied: between the 2 deflection plates.

2. Discover Lissajous figures by superimposing a changing electric and magnetic field.



Task

- Apply a sawtooth voltage to the electron beam as in Task 3.
- Turn on **second power supply connected to AC** as before.
- Use both knobs on the electron tube to increase and decrease the frequency of the sawtooth voltage to create different Lissajous figures.
- (You can use the ring magnet to adjust the beam, so the figures become more central)
- You can hold the electromagnet in your hand however you want to try and create as many shapes as you can.



CAREFUL! Don't touch the glass!



Observation

How many different patterns can you create?

Go further...

- Create your own artist's impression of Lissajous figures on a blank piece of paper.
- Lissajous figures are sometimes used as logos, do you know any?