task_l9hubowt6x00b2h5_with_calculation

Student Group

First Name	Surname	Matrikel Nr.

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Exercise E22 Determining the Current from Charge per Time

Two objects experience a charge increase per time. In the figure 1 one can see the changes in the charge per time.

Fig. 1: Time course of the charge

1. How can the current be determined, when the charge changes non-linearly?

Result

A non-linear charge increase leads to a non-constant current.
For a non-constant current, one has to use the time derivative of the charge Q to get the current I.
So, the formula $I= {{{\rm d} Q}\over{{\rm d} t}}$ has to be used instead of $I= {{\Delta Q}\over{\Delta t}}$.

2. Determine the currents I_1 and I_2 for the two objects from the Q-t-diagram figure 1 and plot the currents into a new diagram.

Solution

- Have a look how much increase ΔQ per time duration Δt is there for each object.
- For this choose a distinct time period, e.g. between $0~\rm s$ and $20~\rm s$.
- The current is then given as the change in charge per time: $I= {{\Delta Q}\over{\Delta t}}$