

(8.5) In a proportional counter filled with methane of 1 atm the multiplication is $2 \cdot 10^4$. What is the maximum pulse size for a 5.4 MeV α , if the ion-pair formation energy is assumed to be 30 eV?. The capacitance of the circuit is 100 pF.

Some useful constants and definitions:

$$eV := 1.6021773 \cdot 10^{-19} \cdot \text{joule}$$

$$q_e := 1.6021773 \cdot 10^{-19} \cdot \text{coul}$$

Data given in the text:

$$E_\alpha := 5.4 \cdot 10^6 \cdot \text{eV} \quad w := 30 \cdot \text{eV} \quad (\text{eV/ion pair in methane})$$

$$C := 100 \cdot \text{pF} \quad f := 2 \cdot 10^4$$

Calculations using eqn. (8.2) and (8.7):

$$\Delta Q := \frac{E_\alpha}{w} \cdot q_e \quad \Delta V := \frac{\Delta Q \cdot f}{C} \quad \Delta V = 5.8 \cdot \text{volt}$$