Signal Development in Wire Chambers – Approximation – Please check.

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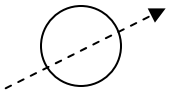
Ionization trail due to charged particle ≈ 3clusters/mm ≈ 9 electrons/mm
Ion drift velocity in 90:10 Ar:CO2 ≈ 50 μm/nS

1 MIP = d x 9 e/mm x Gain

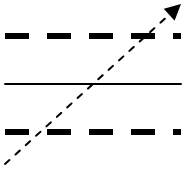
CDC



d = 1.6 cm
Gain = 2 x 10^4
Tdrift = 320 nS

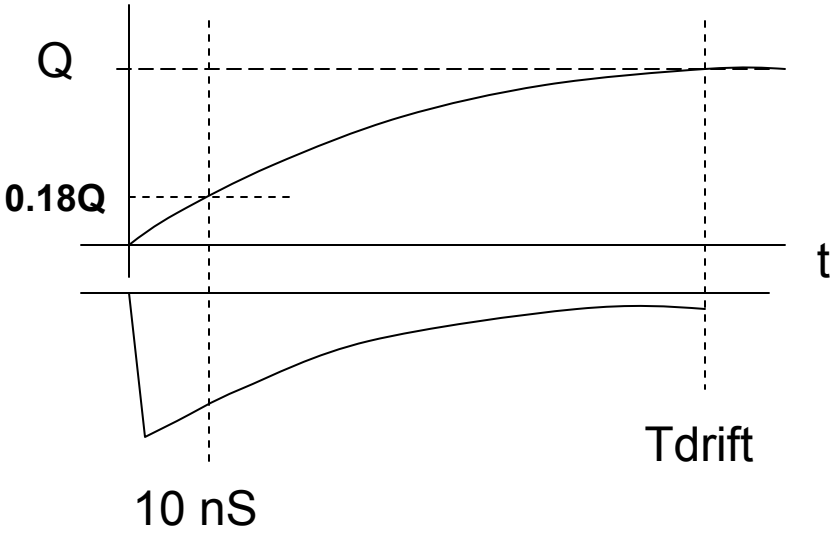
1MIP = 461 fC ← 144 electrons

FDC



d = 1.0 cm
Gain = 4 x 10^4
Tdrift = 200 nS

1MIP = 577 fC ← 90 electrons



To Minimize deadtime, sample a portion of total charge and use tale compensation:

- **18% of total charge in the wire is available in the first 10nS of the drift time. Peaking time ≈ 10 nS (FDC) – 16 nS (CDC)**

For best S:N, Cdet ≈ Camp → Qin = ½ Qtotal:

CDC: 1 MIP → Qin = 461 fC x 0.18 x 0.5 = 41 fC

FDC: 1 MIP → Qin = 577 fC x 0.18 x 0.5 = 52 fC