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Critical test of geminate recombination in liquid argon

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Ionization Yield in LAr

W_{Ion} = 23.6 eV/e^-

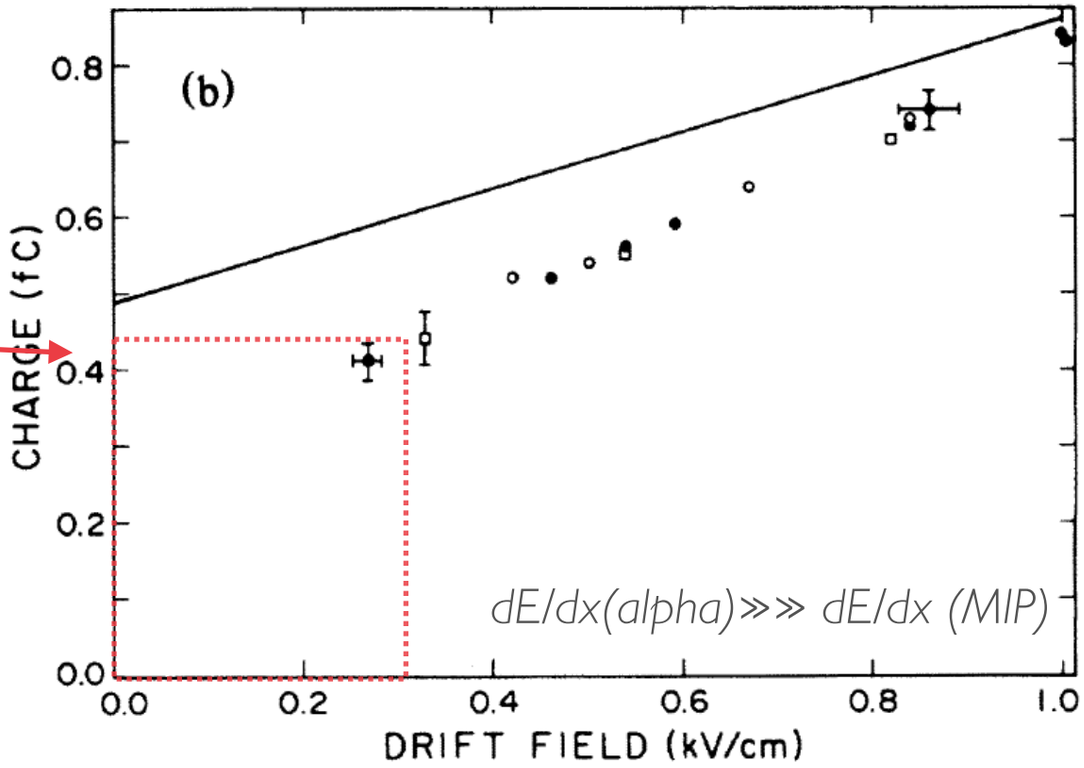

FIG. 2. Data corresponding to Fig. 1, but using an ^{241}Am source.

alpha 5.64 MeV - Q_0 = 38.5 fC

Q_{free} (0.3 kV/cm)= 0.45 fC

R= Q_{free}/Q_0 **= 0.011**

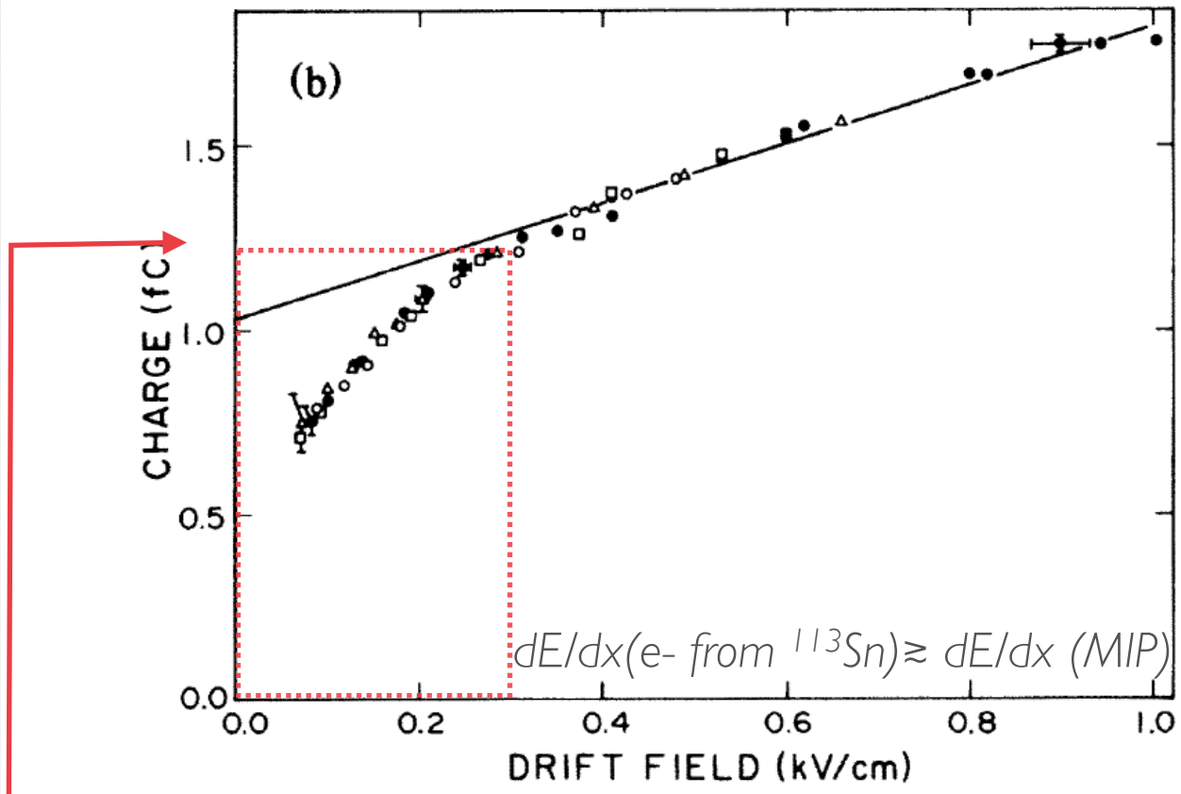

FIG. 1. The free-ionization electron charge collected using a ^{113}Sn source is shown vs drift field for the high-field

electron 364 keV - Q_0 = 2.5 fC

Q_{free} (0.3 kV/cm)= 1.2 fC

R= Q_{free}/Q_0 **= 0.5**

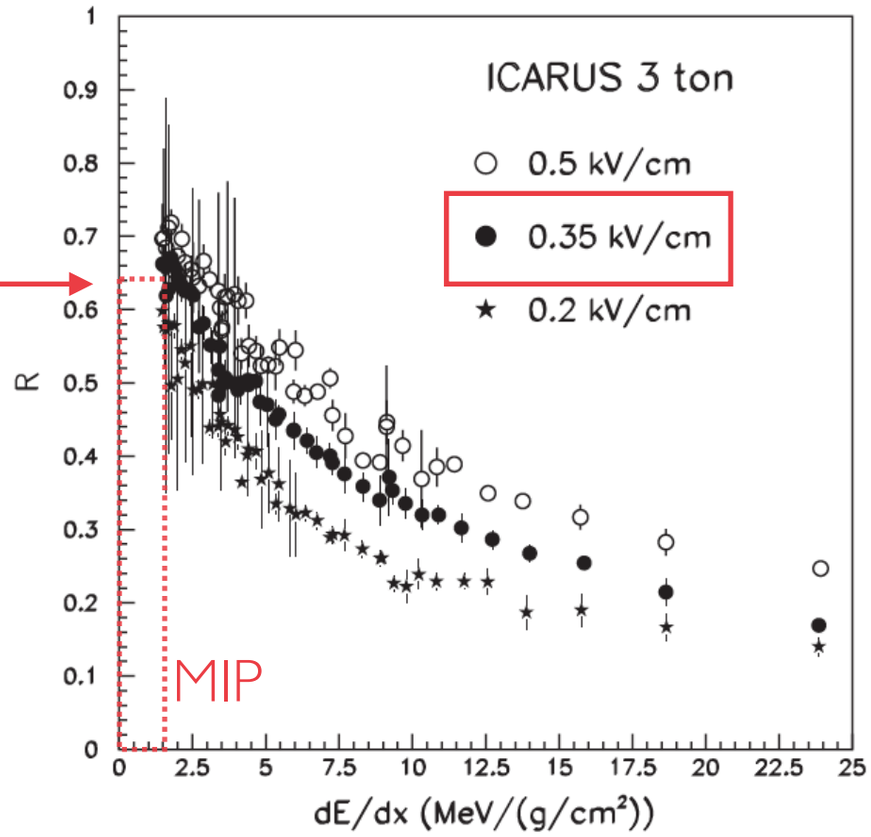

Fig. 1. Recombination factors measured with the 3 ton ICARUS prototype as a function of the theoretical particle stopping power, for different electric field values.

Study of electron recombination in liquid argon with the ICARUS TPC

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For *same ionization amount* Q_0
at 0.3 kV/cm:
Q_{free} (MIP) ≃ 60 × Q_{free} (alpha)

What is the uB S/N from the wires ?

MIP 2.1 MeV/cm
MIP 0.7 MeV (one wire pitch - *3mm*)

Q_0 = 5 fC

R= Q_{free}/Q_0 **= 0.64**

Q_{free} (0.3 kV/cm)= 3.2 fC

In LArIAT (at 0.5 kV/cm)
S/N ≃ 50
(mip ⟨⟩≃ 100 ADC,
noise σ ≃ 2 ADC)

⇒ alpha ⟨⟩≃ 1.7 ADC ≲ noise σ

(presumably not visible)