

- I. Test of feasibility of calibrating ion chambers with gamma sources and SWIC electronics.
- II. Test of one channel of SWIC electronics for reproducibility, drift, sensitivity
- III. Potential for alpha-source calibration suggested by David B.

I.

- a. Gain between integrator and ADC can be 1X, 10X, or 100X
- b. With a 200 μCi γ -source 2 inches from chamber one gets 1% accuracy on the signal using 20-30 measurements.
- c. Measurement-to-measurement fluctuations on the integrating capacitor were about 0.4 mV rms
- d. Pedestal drift on the integrating capacitor over one day was about 1 mV

II.

A. A single measurement seems to be reliable to 1 mV or better. So for single-spill measurements we want 100 mV on the capacitor (100 pF) to get 1% accuracy.

B. This implies $Q = 100 \text{ pF} \times 100 \text{ mV} = 10^{-11} \text{ C}$

C. $n = 94 \text{ i.p./cm}$ in argon gas

$Q/ne = 6.65 \times 10^5 \text{ tracks/spill}$ for 1% accuracy

D. With 100 spills (3 min) one can go to $6.65 \times 10^3 \text{ tracks per spill}$. A pad with 10 cm^2 area can measure fluxes of $6.65 \times 10^2 \text{ per cm}^2 \text{ per spill}$ to 1% using SWIC electronics !

III. Calibration with α -sources

A. $0.9 \mu\text{Ci Am}^{241}$ used in smoke detectors

B. $7 \text{ MeV } \alpha$ goes about 7 cm in gas

C. I. C. would see about 5 MeV ($5 \times 5 \text{ cm}^2$ pad)

D. Takes about 30 eV to make ion pair in any gas

E. $5 \times 10^6 \text{ eV} / 30 \text{ eV} = 1.67 \times 10^5$ pairs/ α -decay

F. $0.9 \times 10^{-6} \text{ Ci} \times 3.7 \times 10^{10} \text{ dcy/s-Ci} = 3.33 \times 10^4 \text{ dcy/sec}$

G. $Q = 1.67 \times 10^5 \text{ pr/dcy} \times 3.33 \times 10^4 \text{ dcy/sec} \times 1.6 \times 10^{-19} \text{ C/pr}$
 $\times 7.86 \times 10^{-2} (\text{d}\Omega) = 7 \times 10^{-11} \text{ C/sec}$

H. $V_{\text{cap}}(1 \text{ sec}) = Q/C = 7 \times 10^{-11} \text{ C} / 10^{-10} \text{ F} = 0.7 \text{ Volts !!!}$

- I. 10 μsec integration of α -source gives 7 μV ,
much less than SWIC measuring errors.

- J. Conclusion: α -calibration can be done between spills.
Pedestal runs not necessary either.