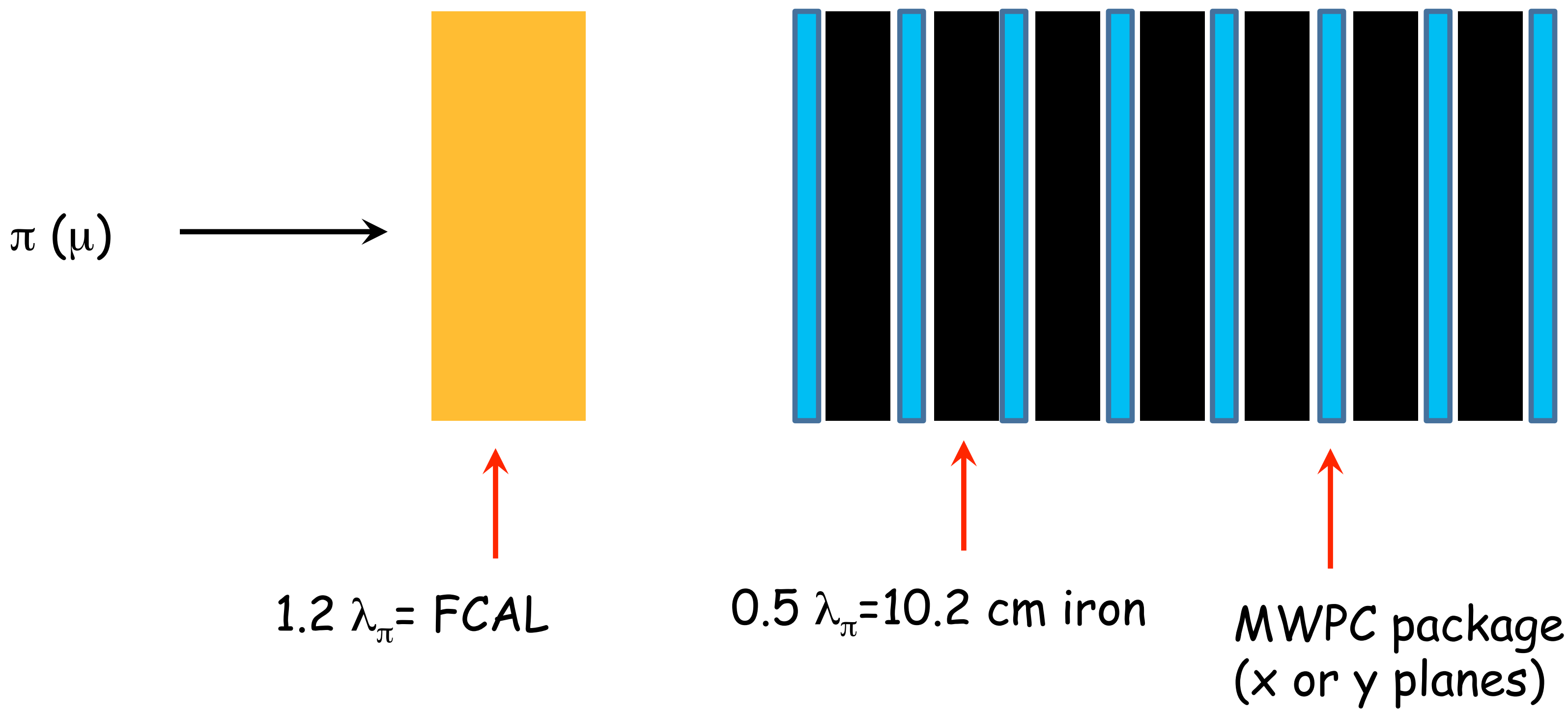
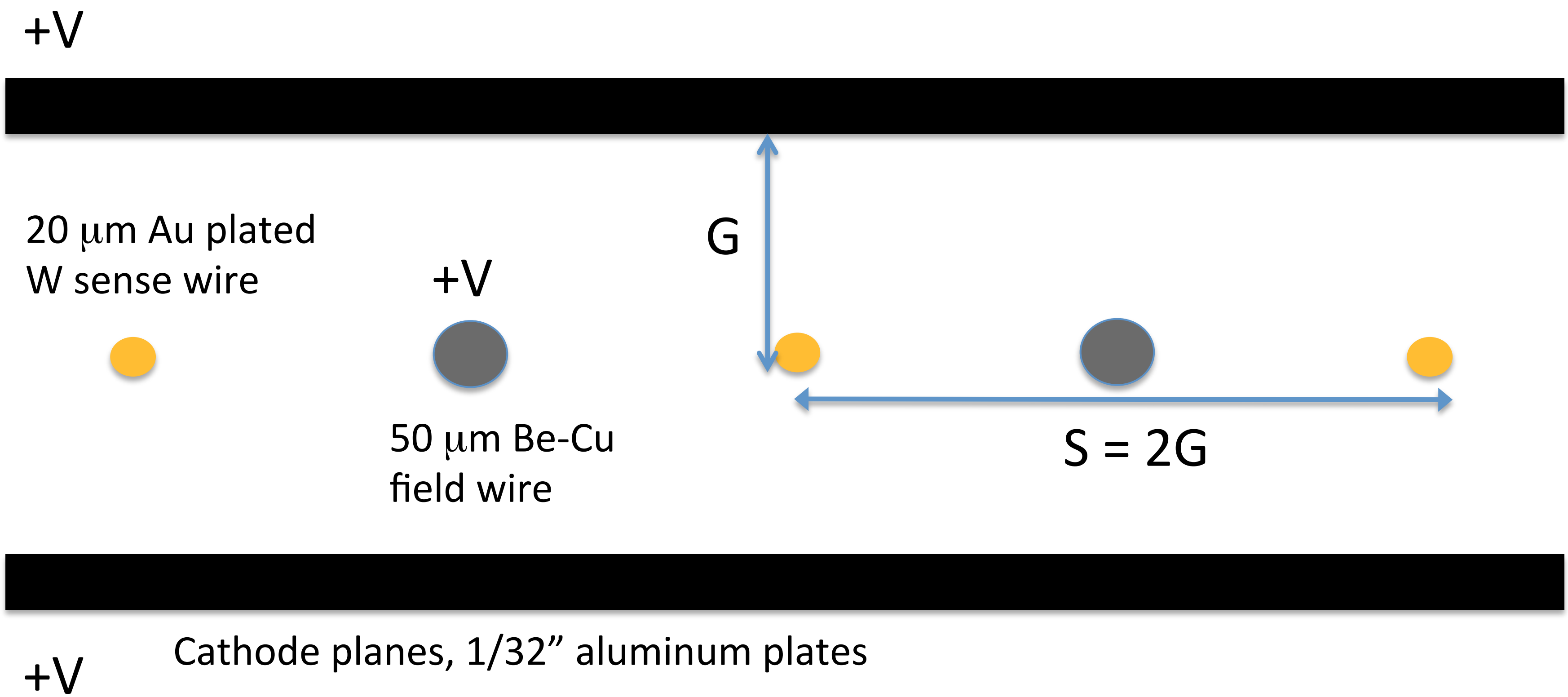
Muon detector design

Muon detector:

- FCAL and iron absorbers to initiate pion showers
- Particle detection in FCAL and MWPC's



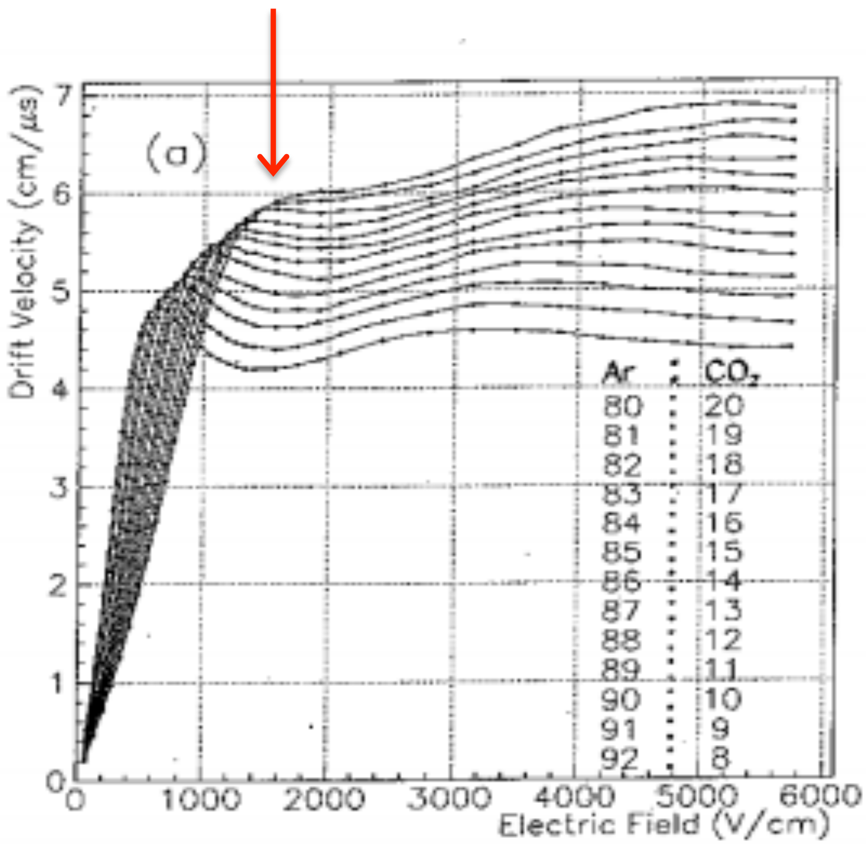
Chamber geometry



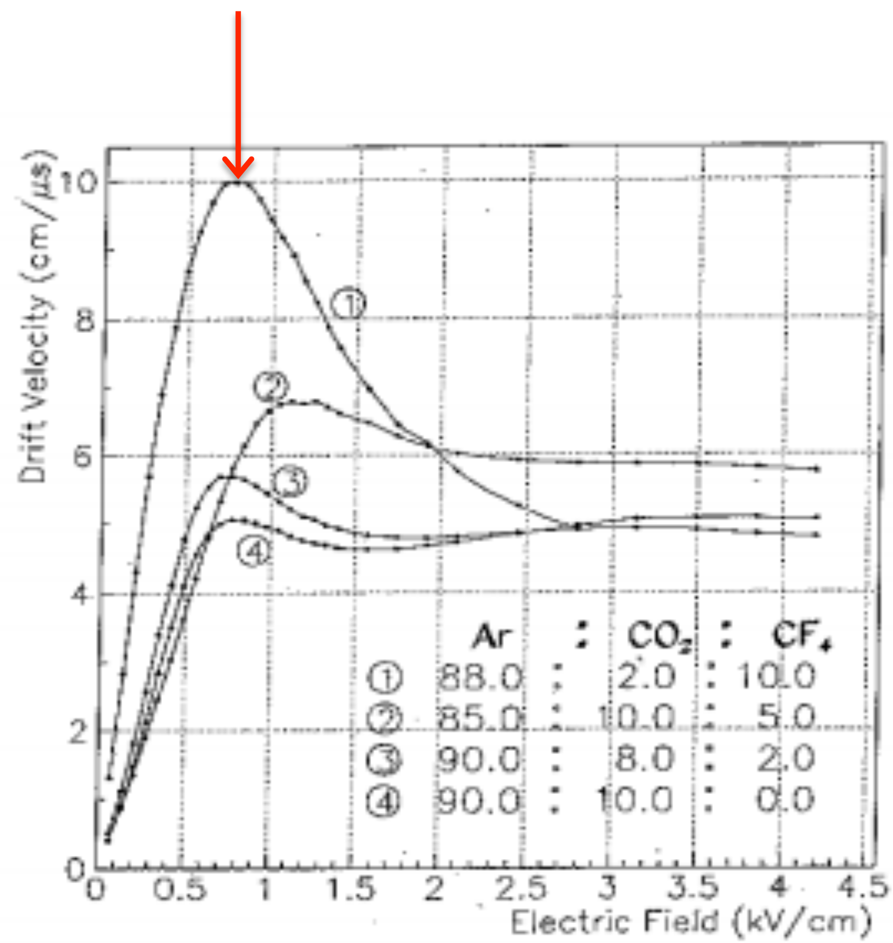
For the designs we've considered so far, S=2G

Choice of gas and electric field

Ar:CO_2 80:20
6 cm/μs @ 1.5 kV/cm

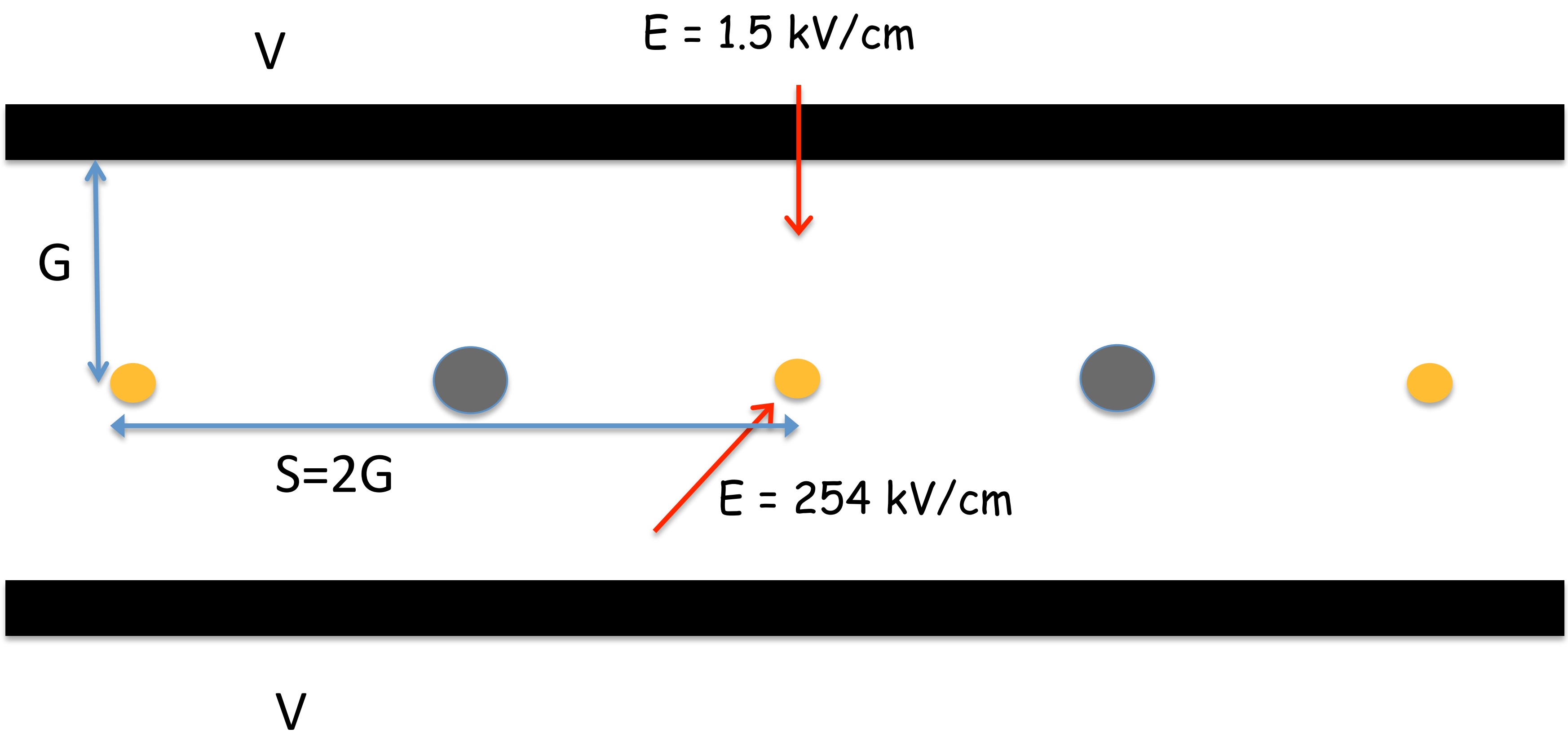


Ar:CO_2:CF_4 88:2:10
10 cm/μs @ .75 kV/cm



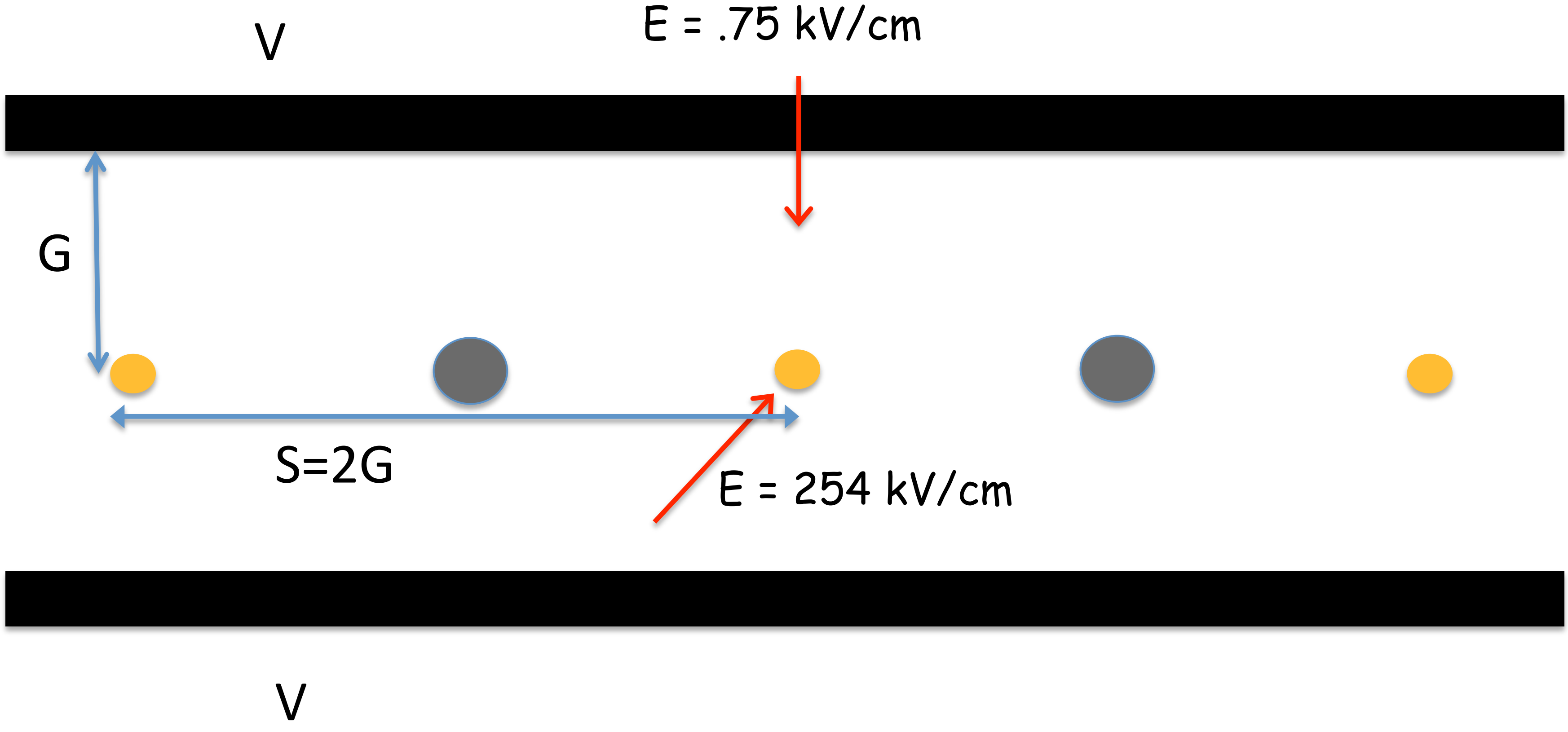
Zhao et al, Nucl. Inst. & Methods, 1993

Optimize size and voltage for $Ar:CO_2$ = 88:20



E = 254 kV/cm corresponds to a gas gain of 10^5

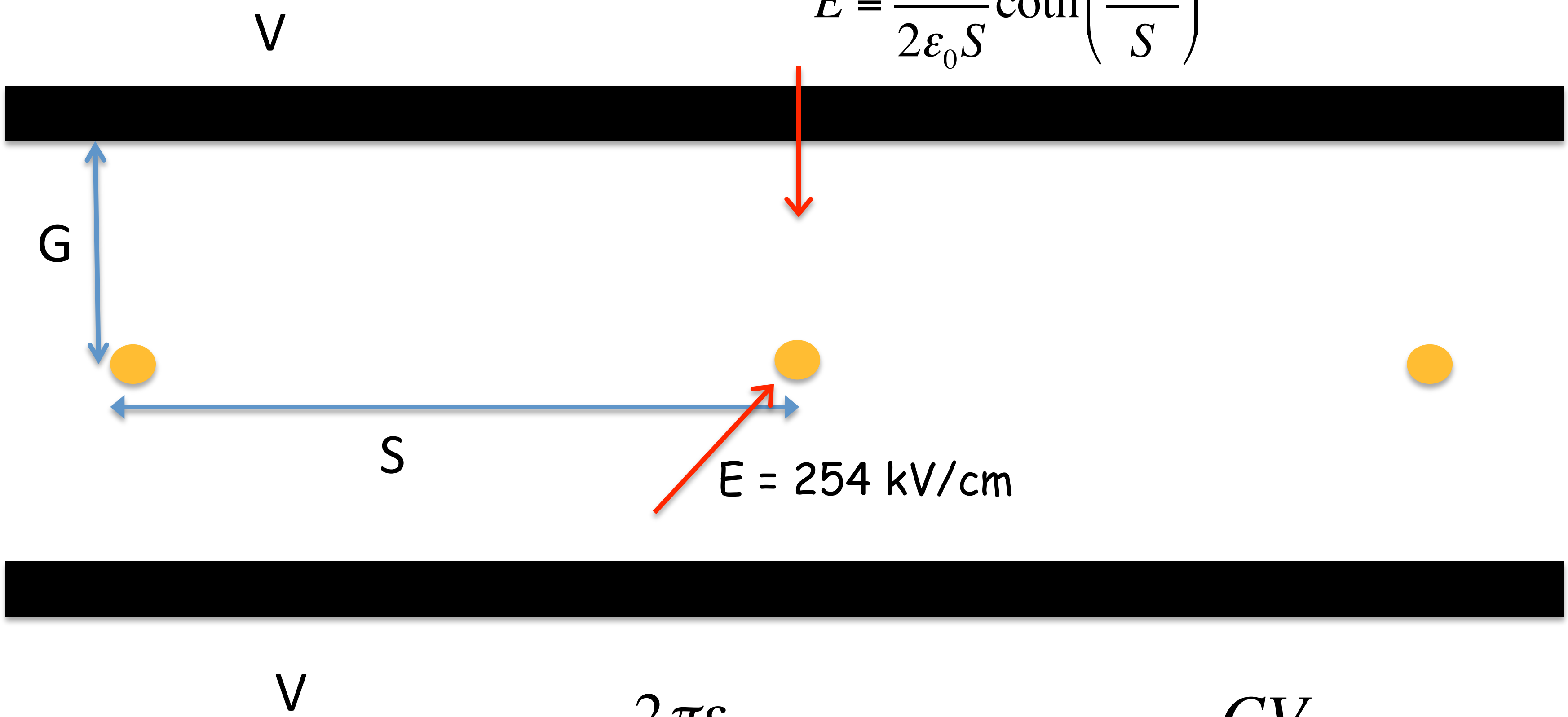
Optimize size and voltage for $Ar:CO_2:CF_4$ = 88:2:10



E = 254 kV/cm corresponds to a gas gain of 10^5

Analytic expression for electric field

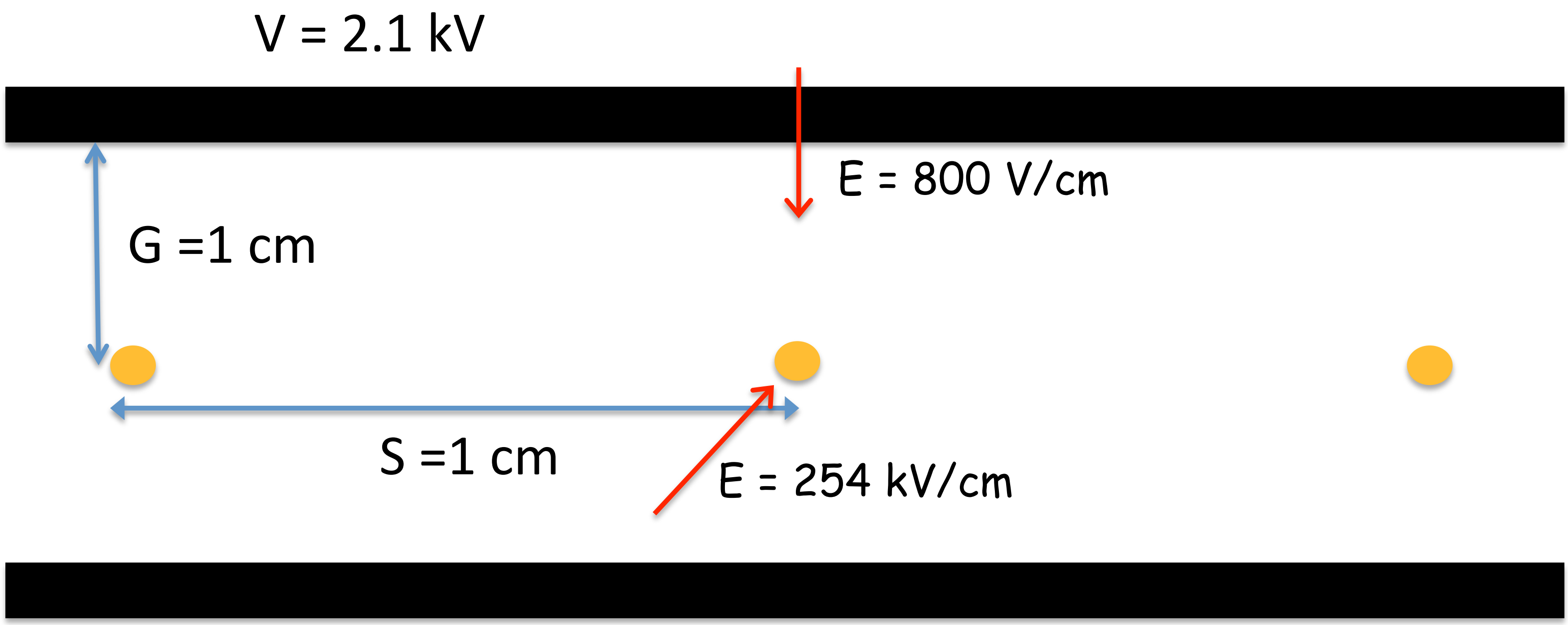
$$E = \frac{CV}{2\varepsilon_0 S}\coth\left(\frac{\pi G}{S}\right)$$



$$C = \frac{2\pi\varepsilon_0}{\frac{\pi G}{S} - \ln\frac{2\pi r_s}{S}}$$

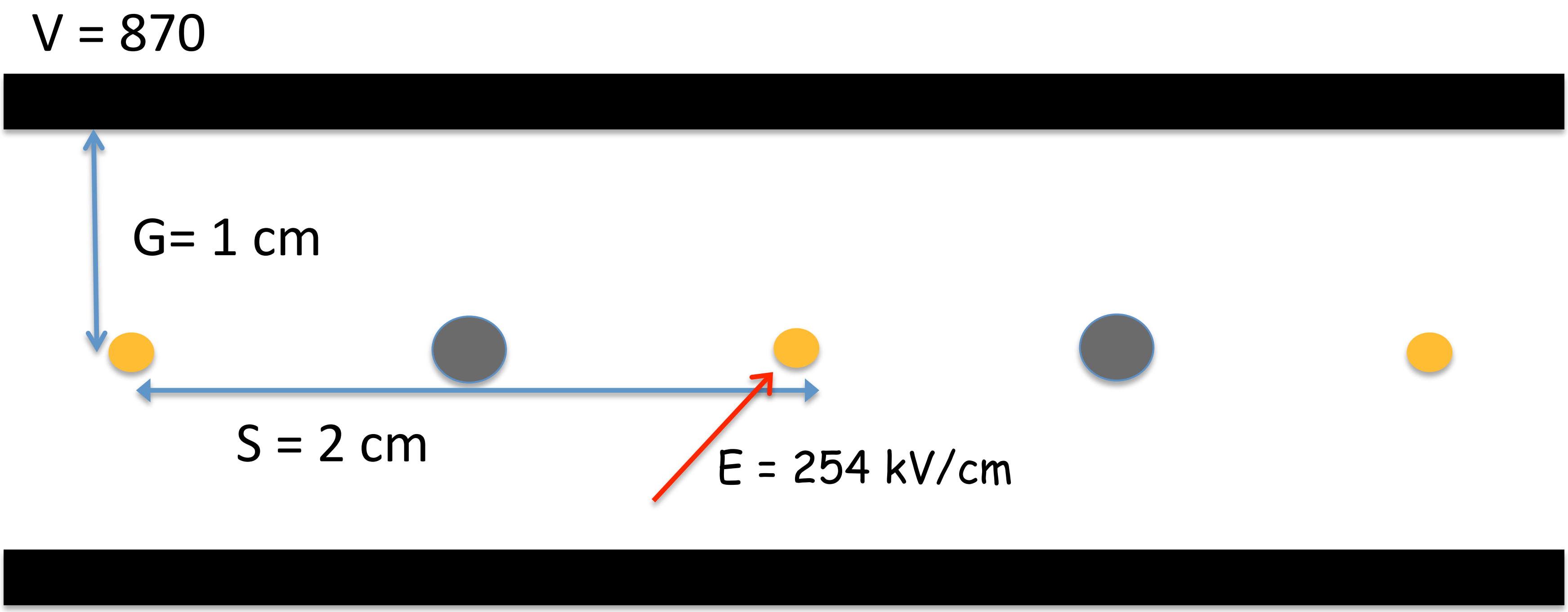
$$E_s = \frac{CV}{2\pi\varepsilon_0 r_s}$$

Analytic expression for electric field: need to check with Garfield



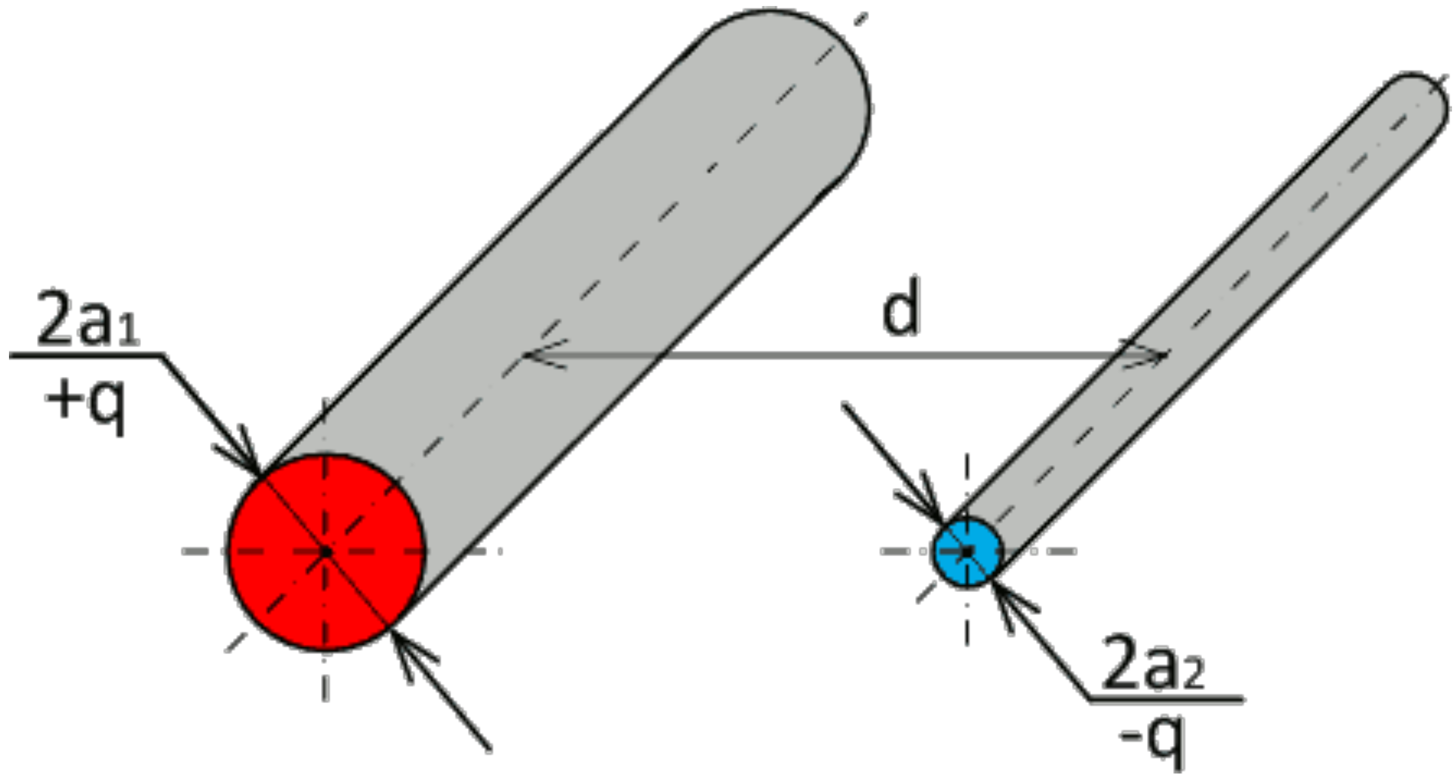
$$C = \frac{2\pi\varepsilon_0}{\frac{\pi G}{S} - \ln\frac{2\pi r_s}{S}} \qquad E_s = \frac{CV}{2\pi\varepsilon_0 r_s}$$

Analytic expression for electric field: need to check with Garfield



$$C \approx \frac{2\pi\varepsilon_0}{\frac{\pi G}{S} - \ln\frac{2\pi r_s}{S}} + 2\cdot\frac{2\pi\varepsilon_0}{\ln\left(\frac{(S/2)^2}{r_s r_g}\right)}$$

$$E_s = \frac{CV}{2\pi\varepsilon_0 r_s}$$



$$C = 2\pi \cdot \varepsilon \cdot \varepsilon_0\, l \,/\, \ln(\, d^2/a_1 \cdot a_2\,)$$