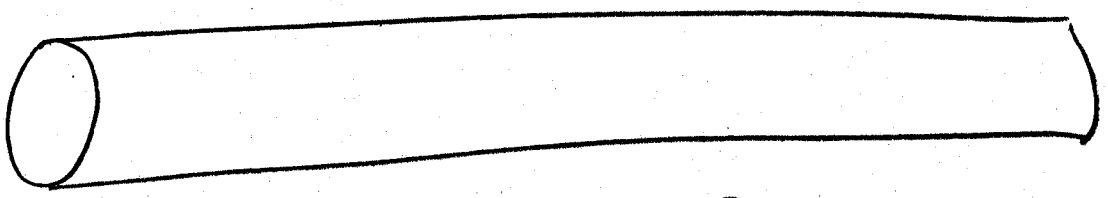
Space charge confinement



uniform cylinder of charge

$$\left.\begin{array}{l} R = 5\,cm \\ L = 170\,m \\ 1.5\times10^{14}\ \text{protons} \end{array}\right\} \rho = 1.8\times10^{-5}\ C/m^3$$

$$E_{sc} = \frac{\rho r}{2\varepsilon_0} = 5\times10^{4}\ V/m$$

E×B drift:

$$R = \frac{E\,m}{q\,B^2} = \frac{2.8\times10^{-7}\ m}{B^2}$$

at $B = 0.02\ T$

$$\boxed{R = 0.7\ mm}$$