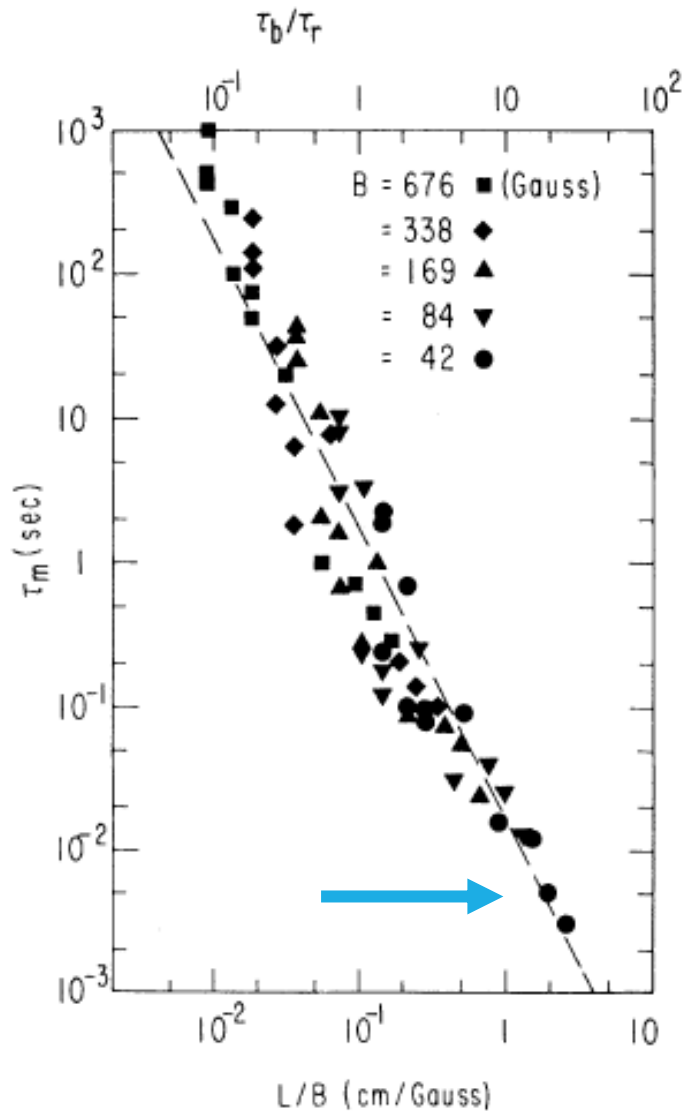# PM trap - toy simulation

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Length-Dependent Containment of a Pure Electron-Plasma Column

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Plasma parameters

- $n_e = 1.4 \times 10^7$ cm⁻³
- $R_p = 1.4$ cm
- $T = 1$ eV
- $\lambda_D \approx 2$ mm
- gyro period $\approx 8.9 \times 10^{-9}$ s
- plasma period $\approx 3 \times 10^{-8}$ s
- Brillouin limit $n_e = 8 \times 10^7$ cm⁻³

Lens parameters

- $L_{anode} = 100$ cm
- $R_w = 3$ cm
- $B = 40$ G
- $V = 50$ V

Plasma parameters

- $n_e = 1.4 \times 10^7$ cm⁻³
- $R_p = 1.4$ cm
- $T = 1$ eV
- $\lambda_D \approx 2$ mm
- gyro period $\approx 8.9 \times 10^{-9}$ s

Simulation parameters

- $dx = dz = 2$ mm
- grid size 32x32x562
- 5 macroparticles per cell
- elastic collisions included

Results

Solver	Time step dt [s]	# steps	CPU time [min:sec]	24h CPU time
ES solver	2.76×10^{-10}	100	4:22	$\approx 9\ \mu s$
EM solver	1.83×10^{-12}	1000	2:04	$\approx 1\ \mu s$

- 50 CPU cores