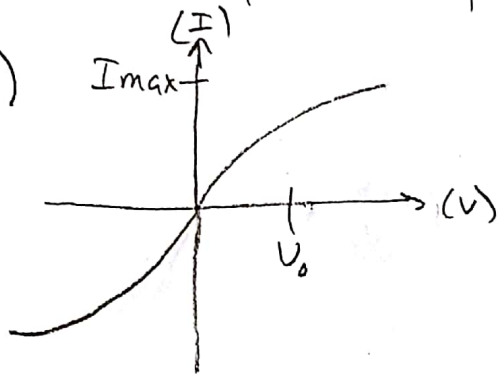
2012 I : 1A Diagnostics

★ Electron-positron plasma. → symmetric

1)



$I_{max} \sim e n_e A v_t \sim e n_e A \sqrt{\frac{T}{m}}$

$\sim (10^{-19}\ C)(10^{8}\ cm^{-3})\sqrt{\frac{(1eV)(10^{-19}\ eV/_{J})}{10^{-31}\ kg}}$

$31-19 = 12$

$\sim 10^{-11}\left(\frac{C}{cm}\right) 10^{6}\left(\frac{m}{s}\right) 10^{2}\left(\frac{cm}{m}\right)$

$\sim 10^{-11}\, 10^{8}\ \frac{C}{s} \Rightarrow \underline{I_{max} \sim 1\ mA}$

$V_0 \sim \frac{1eV}{e} \Rightarrow \underline{V_0 \sim 1V}$

2) electron-positron so V_f has no sheath. Thus $V_f = V_p$

$\Delta V = V_p - V_{wall} = 0$

3) At $V = \pm 50$, $I = I_{max} \sim 1\ mA$

$P = \frac{E}{S}$ energy of one particle ~> 50 eV

10^{-3} particles/s

$\Rightarrow P \sim 5\times10^{-2}\ \frac{eV}{s}$

$\frac{P}{A} \sim \frac{5\times10^{-2}\ \frac{eV}{s}}{1\ cm^2} \Rightarrow \boxed{\frac{P}{A} \sim 0.05\ \frac{eV}{s\,cm^2}}$