

$$I_{sp} = 3500 \text{ sec} \quad \frac{\phi_A - \phi_C}{d} = 10^5 \text{ V/cm}$$

$$q/m = 2500 \frac{C}{kg}$$

$$I_{sp} = \frac{1}{g_0} \sqrt{2 \frac{q}{m} (\phi_A - \phi_C)} \Rightarrow \frac{(I_{sp} \cdot g_0)^2}{2} \left[ \frac{q}{m} \right]^{-1} = \phi_A - \phi_C$$

$$= \frac{(3500 \cdot 9.81)^2}{2 \cdot 2500} = 235778.445 \text{ V}$$

$$\frac{\phi_A - \phi_C}{d} = C \Rightarrow \frac{\phi_A - \phi_C}{C} = \frac{235778.445 \text{ V}}{10^5} = 2.35778 \text{ cm}$$

$$\Delta V = 70000 \text{ m/s}$$

$$C = I_{sp} g_0 = 3500 \cdot 9.81 = 34335 \text{ m/s}$$

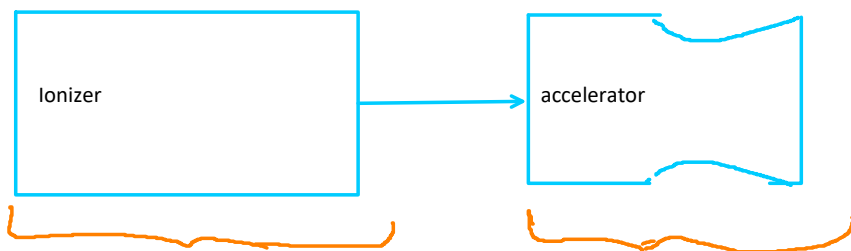
$$m_p = m_0 \left(1 - e^{-\frac{\Delta V}{C}}\right) \quad \kappa = \frac{\Delta V}{C} = 2.038736$$

$$m_p = 80000 (1 - e^{-\kappa}) = 69584.54615 \text{ kg}$$

$$m_0 = m_e + m_c + m_p \Rightarrow m_0 - m_p - m_c = m_e = 5415.45385 \text{ kg}$$

$$\alpha' = 600 \text{ W/kg}$$

$$\dot{W}_e = m_e \alpha' = 5415.45385 \cdot 600 = 3249272.31 \text{ W} = 3249.27231 \text{ kW}$$



$$35 \text{ W}_e = 1137.245309 \text{ kW}$$

$$65 \text{ W}_e = 2112.027002 \text{ kW}$$

$$j = .4444 \epsilon_0 \sqrt{2 \left( \frac{q}{m} \right)} \frac{(\phi_A - \phi_C)^{3/2}}{d^2} = .4444 \epsilon_0 \sqrt{2 \cdot 2500} \frac{(235778.445)^{3/2}}{.0235778}$$

$$j = 55.327101 \text{ Amp/m}^2$$

$$2112.027002 \text{ kW}$$

$$\text{Power}_{AC} = V j A \Rightarrow \frac{\text{Power}_{AC}}{V j} = A = \frac{2112.027002 \text{ kW}}{235778.445 \text{ V} \times 55.327101 \text{ Amp/m}^2} = 0.161904 \text{ m}^2$$

$$\text{Diameter of beam} = (4(0.161904 \text{ m}^2)/\pi)^{(1/2)} = 0.4540291 \text{ m}$$

$$\frac{\text{Thrust}}{\text{Area}} = \left( \frac{q}{m} \right)^{-1} j \sqrt{2 q/m} (\phi_A - \phi_C)^{1/2} = \frac{1}{2500} * 55.327101 \sqrt{2 * 2500(235778.445)} = 759.8624116$$

$$\text{Thrust} = CA = 759.8624116 * 0.161904 = 123.0247639 \text{ N}$$

$$\dot{m} = \frac{\text{Thrust}}{V_e} = \frac{123.0247639}{34335} = 0.0035830716 \frac{\text{kg}}{\text{s}} = 3.5830716 * \frac{10^{-3} \text{ g}}{\text{s}}$$



$$T_3 = 3000 \text{ K}$$

$$\eta_c = \eta_t = 0.9$$

$$\gamma = 1.4$$

$$R = 296.8 \text{ J/kg K}$$

$$C_p = 1038.8 \text{ J/kg K}$$

From code:  $\pi_c$  ranges from 1 to 6 and  $T_a$  ranges from 500 K to 1700 K

$$\begin{aligned} \pi_c &= 2.64 \\ T_a &= 1472 \text{ K} \\ T_2 &= 1994.80286196426 \text{ K} \\ \eta &= 0.130519423193357 \\ A_{\text{rad}} &= 1.05785661271208\text{e-}05 \end{aligned}$$

$$T_{I+}$$