1. (a) the capacitance per unit length

\[ C = \frac{\varepsilon \varepsilon_0}{d} = \frac{\varepsilon w}{d} \quad \text{\& (d is the distance between two strips)} \]

(b) the magnetic field between the strips is

\[ B = \mu_0 i \quad \text{\& i is the density of surface current} \]

(c) the magnetic energy per unit length is

\[ W_m = \frac{1}{2} \frac{B^2}{\mu_0} \cdot w \cdot d = \frac{1}{2} \mu_0 i^2 \cdot w d \]

\[ = \frac{1}{2} \cdot L \cdot (wi)^2 \]

(d) the inductance per unit length is

\[ L = \frac{A \cdot d}{w} \]

(c) the propagating speed of electromagnetic perturbation

\[ \text{as} \quad V_e = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{\varepsilon \frac{w}{d} \cdot w \cdot d}} = \frac{1}{\sqrt{\varepsilon \mu}} \]

2. Before the interaction, in the lab system the 4-momentum vector is

\[ \mathbf{S}_1 = \left( P_{\text{x}1} , \frac{i}{c} \right (E_{\text{x}1} + m_1 c^2)) \]

\[ \text{\&} \quad \mathbf{S}_2 = \left( P_{\text{x}2} , \frac{i}{c} \right (E_{\text{x}2} + m_2 c^2)) \]

After the interaction, when the products have the same velocity we have the threshold energy. In the rest frame of the products, the 4-momentum vector

\[ \left| \mathbf{S}_2 \right|^2 = - \frac{1}{c^2} \left( m_{k1} + m_{k2} \right)^2 c^4 \]
\[ |\overline{S}_{\perp}|^2 = |\overline{S}_{\parallel}|^2 \]

\[ \Rightarrow (m_k + m_\pi)^2 c^2 = m_\pi^2 c^2 + m_\rho^2 c^2 + 2 m_\rho E_\pi \]

\[ \Rightarrow E_\pi = \frac{(m_k + m_\pi)^2 c^2 - m_\pi^2 c^2 - m_\rho^2 c^2}{2 m_\rho} \]

\[ = \sqrt{P_{\perp}^2 c^2 + m_\pi^2 c^4} \]

\[ P_{\perp}\mu_\pi = \sqrt{\left\{ \frac{(m_k + m_\pi)^2 c^2 - m_\pi^2 c^2 - m_\rho^2 c^2}{2 m_\rho} \right\}^2 - m_\pi^2 c^4} / c^2 \]

\[ = C \sqrt{\left( \frac{(m_k + m_\pi)^2 c^2 - m_\pi^2 c^2 - m_\rho^2 c^2}{2 m_\rho} \right)^2 - m_\pi^2 c^4} \]

\[ = C \sqrt{\left( \frac{(\frac{1700}{c^2})^2 - (\frac{500}{c^2})^2 - (\frac{900}{c^2})^2}{2 \cdot \frac{900}{c^2}} \right)^2 - (\frac{1500}{c^2})^2} \]

\[ = \frac{\sqrt{113} \cdot 10^3}{c} \]

3. The reflection coefficient \( R = 1 - \sqrt{\frac{\sigma_E u}{\sigma}} \) (\( \sigma \gg \sigma_E \))

The averaged radiation pressure \( \bar{P} \) is

\[ \bar{P} = (1 + \rho) \bar{\omega} \]

\[ \bar{\omega} = \frac{1}{2} E_0 E_0^2 \]

\[ \bar{P} = (1 - \sqrt{\frac{2 E u}{\sigma}}) E_0 E_0^2 \]
The capacity \( V \) of the cylinder is given by:

\[
V = \frac{2\pi}{\ln\frac{b_0}{a}} \left( \bar{\varepsilon} b_1 + \bar{\varepsilon}_0 b_2 \right)
\]

\[
F = \frac{(\varepsilon W e)}{\varepsilon b_1} = \frac{V^2}{2} \frac{\varepsilon c}{\varepsilon b_1} = \frac{\pi}{\ln\frac{b_0}{a}} (\bar{\varepsilon} - \bar{\varepsilon}_0) \cdot V^2
\]

The force \( F \) is equal to:

\[
F = mg = \pi (b^2 - a^2) \cdot h \cdot pg
\]

The height \( h \) is given by:

\[
h = \frac{\pi}{\ln\frac{b_0}{a}} \left( \frac{(\bar{\varepsilon} - \bar{\varepsilon}_0) V^2}{\pi (b^2 - a^2) \cdot pg} \right)
\]

\[
h = \frac{(\bar{\varepsilon} - \bar{\varepsilon}_0) V^2}{\ln\frac{b_0}{a} (b^2 - a^2) \cdot pg}
\]

\[
h = \frac{\Delta e V^2}{(b^2 - a^2) \ln\frac{b_0}{a} \cdot pg}
\]