

$$b_{I1} = 2 \left[\frac{E_I E_1 - P_I P_1 \cos \theta}{m_I \cdot m_1} - 1 \right]$$

$$E_I = \sqrt{m_I^2 + P_I^2} \approx P_I \left(1 + \frac{m_I^2}{2P_I^2} \right)$$

$$E_1 = \sqrt{m_1^2 + P_1^2} \approx P_1 \left(1 + \frac{m_1^2}{2P_1^2} \right)$$

$$b_{I1} = 2 \left[\frac{P_I P_1}{m_I m_1} \cdot \left(1 + \frac{m_I^2}{2P_I^2} \right) \left(1 + \frac{m_1^2}{2P_1^2} \right) - \frac{P_I P_1 \cos \theta}{m_I m_1} - 1 \right]$$

$$\approx 2 \frac{P_I P_1}{m_I m_1} \left\{ 1 + \frac{m_I^2}{2P_I^2} + \frac{m_1^2}{2P_1^2} - \cos \theta - \left(\frac{P_I P_1}{m_I m_1} \right)^{-1} \right\} =$$

$$= 2 \frac{P_I P_1}{m_I m_1} \left\{ 1 - \cos \theta + \frac{1}{2} \left(\frac{m_I}{P_I} - \frac{m_1}{P_1} \right)^2 \right\} \approx$$

$$\approx 2 \frac{P_I P_1}{m_I m_1} \left\{ \frac{\theta^2}{2} + \frac{1}{2} \left(\frac{m_I}{P_I} - \frac{m_1}{P_1} \right)^2 \right\}$$