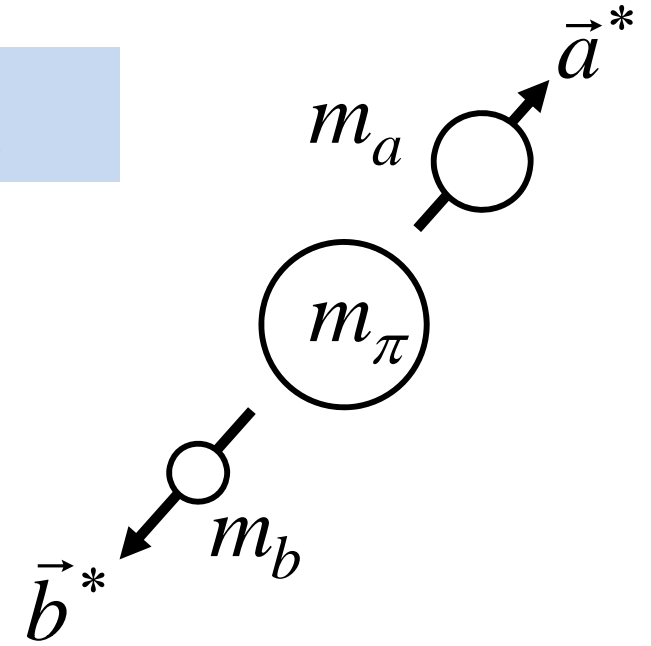


重心系での2体崩壊



$$q_0^* = m_\pi, \quad a_0^* = \sqrt{m_a^2 + (\vec{a}^*)^2}, \quad b_0^* = \sqrt{m_b^2 + (\vec{b}^*)^2}$$

$$\text{運動量保存法則より} \quad \vec{b}^* = -\vec{a}^*$$

$$m_\pi = a_0^* + b_0^* = \sqrt{m_a^2 + (\vec{a}^*)^2} + \sqrt{m_b^2 + (-\vec{a}^*)^2}$$

$$m_\pi^2 = m_a^2 + (\vec{a}^*)^2 + 2\sqrt{m_a^2 + (\vec{a}^*)^2}\sqrt{m_b^2 + (-\vec{a}^*)^2} + m_b^2 + (-\vec{a}^*)^2$$

$$\left(m_\pi^2 - m_a^2 - m_b^2\right)^2 - 4\left(m_\pi^2 - m_a^2 - m_b^2\right)(\vec{a}^*)^2 + 4(\vec{a}^*)^4 = 4\left(m_a^2 + (\vec{a}^*)^2\right)\left(m_b^2 + (-\vec{a}^*)^2\right)$$

$$\left(m_\pi^2 - m_a^2 - m_b^2\right)^2 = 4m_a^2m_b^2 + 4m_\pi^2(\vec{a}^*)^2$$

$$\therefore |\vec{a}^*| = \frac{\sqrt{\left(m_\pi^2 - m_a^2 - m_b^2\right)^2 - 4m_a^2m_b^2}}{2m_\pi} = \frac{\sqrt{\left(m_\pi^2 - (m_a + m_b)^2\right)\left(m_\pi^2 - (m_a - m_b)^2\right)}}{2m_\pi}$$