

$$\eta' \rightarrow \pi^+ \pi^- e^+ e^- / \pi^+ \pi^- \mu^+ \mu^-$$

• 振幅

$$|\overline{\mathcal{A}_{P \rightarrow \pi^+ \pi^- 1+1-}}|^2(s_{\pi\pi}, s_{ll}, \theta_\pi, \theta_1, \phi) = \frac{e^2}{8k^2} |M(s_{\pi\pi}, s_{ll})|^2 \times \lambda(m_P^2, s_{\pi\pi}, s_{ll}) \times [1 - \beta_1^2 \sin^2 \theta_1 \sin^2 \phi] s_{\pi\pi} \beta_\pi^2 \sin^2 \theta_\pi$$

• 形状因子:

$$M(s_{\pi\pi}, s_{ll}) = \mathcal{M} \times VMD(s_{\pi\pi}, s_{ll})$$

$$\mathcal{M} = \begin{cases} \frac{e}{8\pi^2 f_\pi^3} & \text{if } P = \pi^0; \\ \frac{e}{8\pi^2 f_\pi^3} \frac{1}{\sqrt{3}} \left( \frac{f_\pi}{f_8} \cos \theta_{mix} - 2\sqrt{2} \frac{f_\pi}{f_0} \sin \theta_{mix} \right) & \text{if } P = \eta; \\ \frac{e}{8\pi^2 f_\pi^3} \frac{1}{\sqrt{3}} \left( \frac{f_\pi}{f_8} \sin \theta_{mix} + 2\sqrt{2} \frac{f_\pi}{f_0} \cos \theta_{mix} \right) & \text{if } P = \eta' \end{cases}$$

• VMD因子包含三项贡献:

$$VMD_1(s_{\pi\pi}, s_{ll}) = 1 - \frac{3}{4}(c_1 - c_2 + c_3) + \frac{3}{4}(c_1 - c_2 - c_3) \frac{m_V^2}{m_V^2 - s_{ll} - im_V \Gamma(s_{ll})} + \frac{3}{2} c_3 \frac{m_V^2}{m_V^2 - s_{ll} - im_V \Gamma(s_{ll})} \frac{m_V^2}{m_V^2 - s_{\pi\pi} - im_V \Gamma(s_{\pi\pi})}$$

规范模型约定:

$$c_1 - c_2 = c_3 = 1$$

