Double Regge Exchanges

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GlueX meeting
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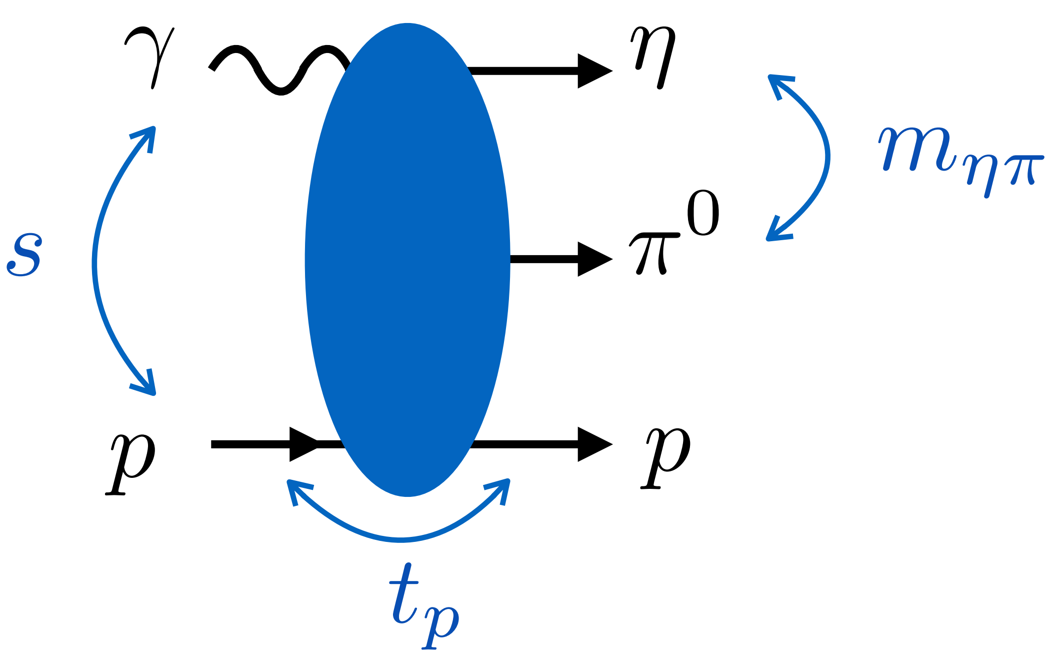
Variables

5 independent variables. Different choices s fixed $m_{\eta\pi}, t_p$ binned

(θ, φ) Angles of the eta in GJ/helicity frame



Variables

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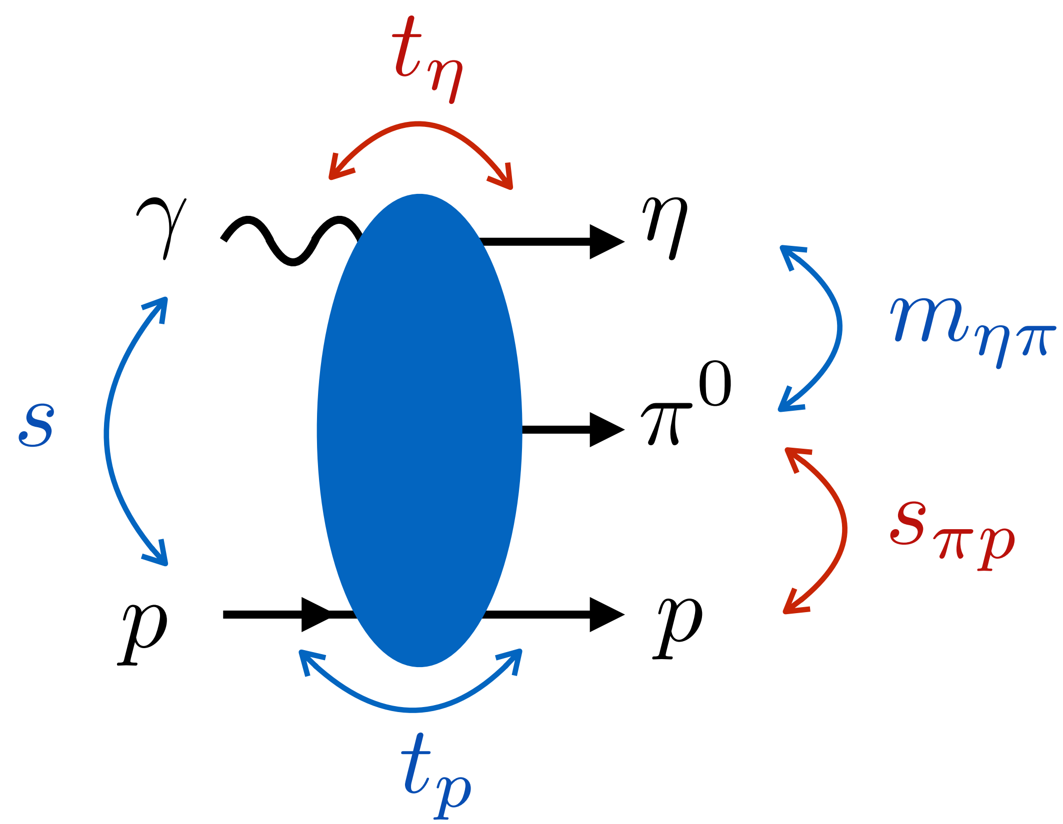


(θ, φ) Angles of the eta in GJ/helicity frame

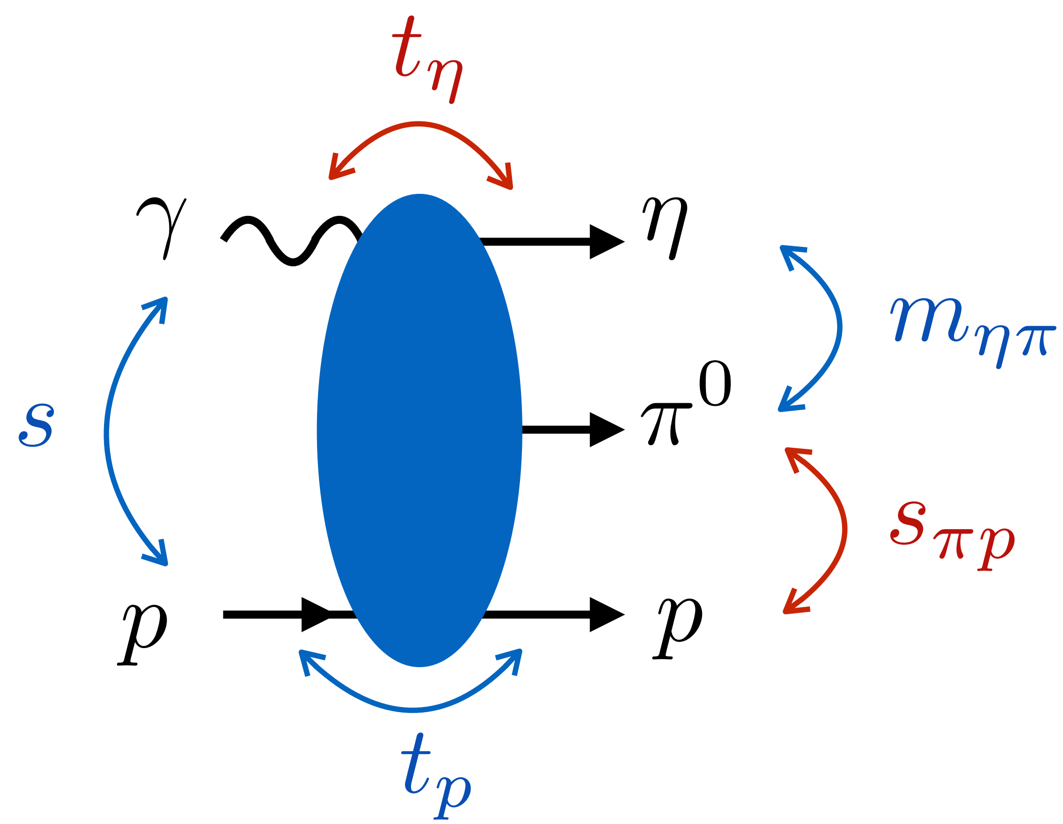
$(t_\eta, s_{\pi p})$

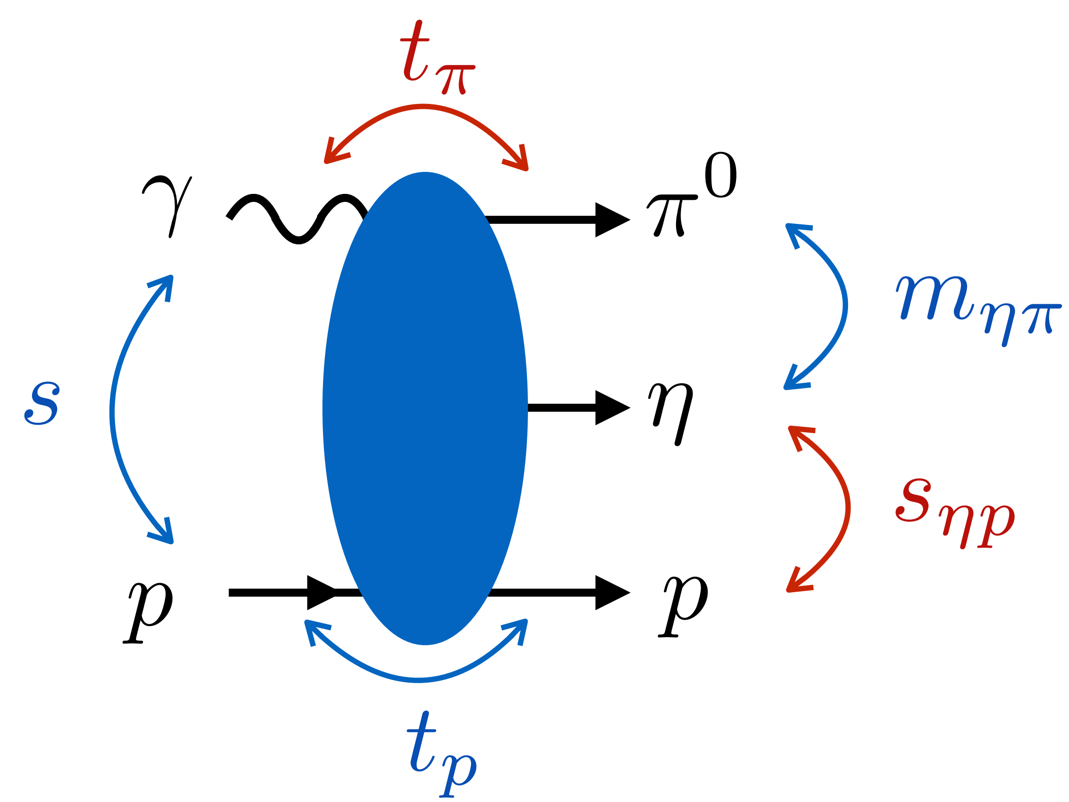
Variables

5 independent variables. Different choices s fixed $m_{\eta\pi}, t_p$ binned

(θ, φ) Angles of the eta in GJ/helicity frame

$(t_\eta, s_{\pi p})$ Or $(t_\pi, s_{\eta p})$





Variables

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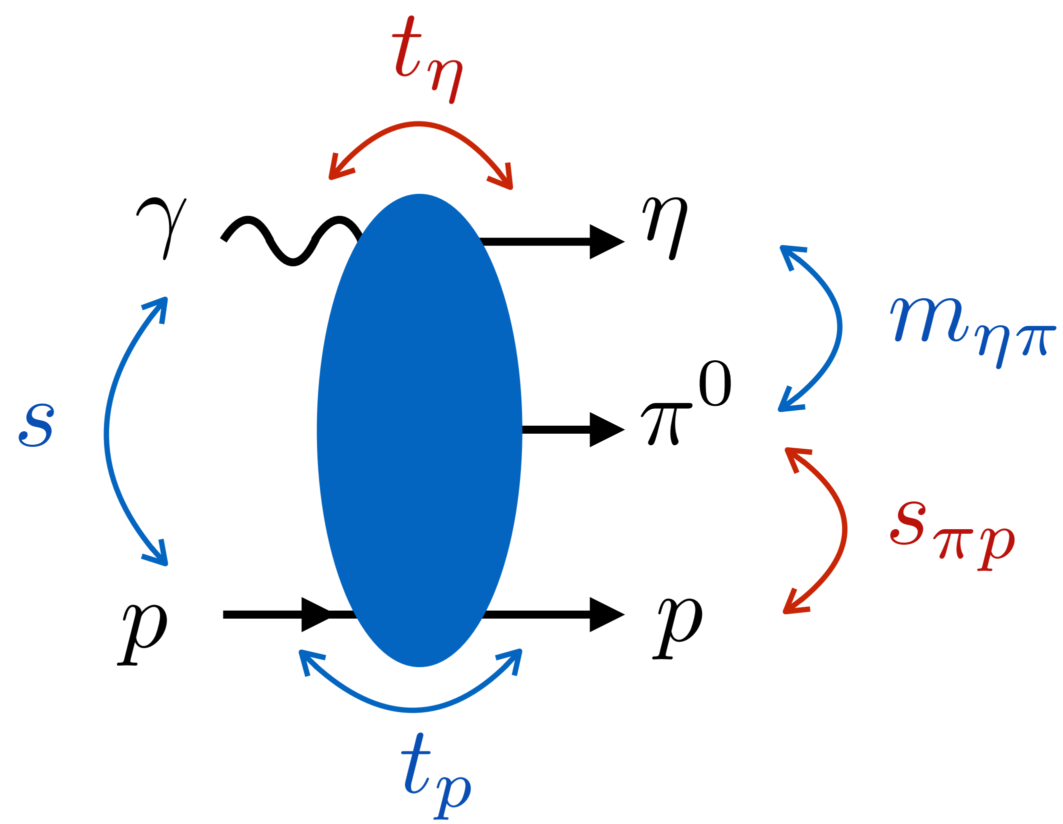
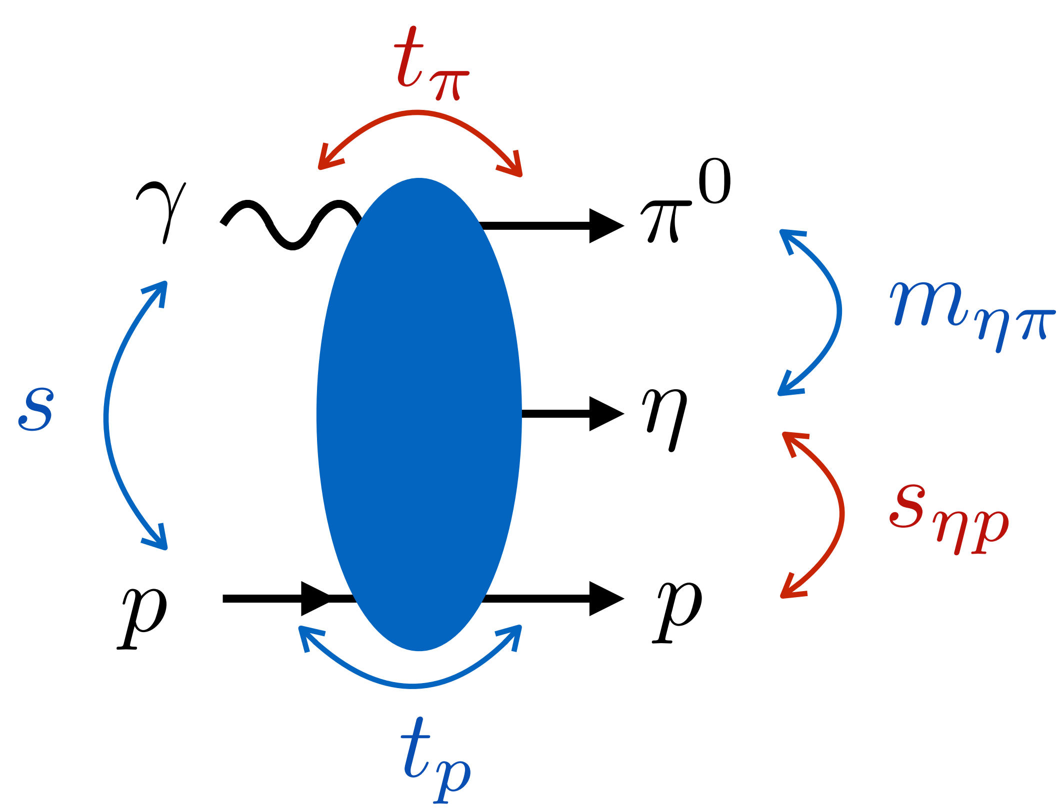


(θ, φ) Angles of the eta in GJ/helicity frame

$(t_\eta, s_{\pi p})$ Or $(t_\pi, s_{\eta p})$

$$\frac{d\sigma}{dt_\eta dm_{\eta\pi}^2} = \frac{(4\pi)^{-3}}{(2m_p E_{\text{lab}})^2} \int\int \frac{dt_p ds_{\pi p}}{(\Delta)^{\frac{1}{2}}} |M|^2$$



$$\begin{aligned}\Delta &= \lambda(s, s_{\eta p}, m_\pi^2)(t_p^- - t_p)(t_p - t_p^+) \\ &= \lambda(t_p, m_{\eta\pi}^2, 0)(s_{\pi p}^- - s_{\pi p})(s_{\pi p} - s_{\pi p}^+)\end{aligned}$$

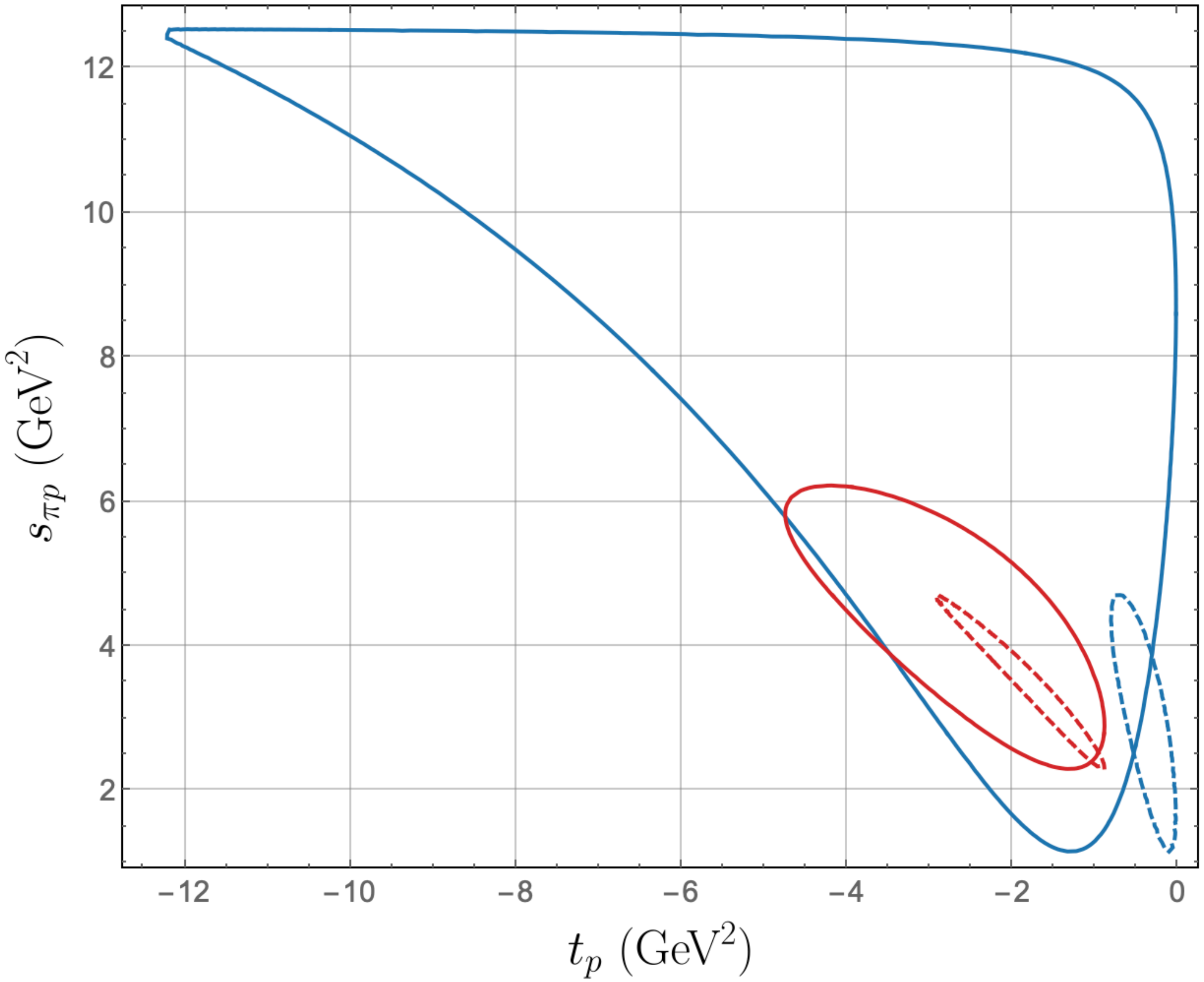
It defines the boundaries

Phase Space

Elab = 8.5 GeV

$$\frac{d\sigma}{dt_\eta dm^2_{\eta\pi}} = \frac{(4\pi)^{-3}}{(2m_p E_{\text{lab}})^2} \int\int \frac{dt_p ds_{\pi p}}{(\Delta)^{\frac{1}{2}}} |M|^2$$

$$\Delta = \lambda(s, s_{\eta p}, m^2_\pi)(t_p^- - t_p)(t_p - t_p^+)$$
$$= \lambda(t_p, m^2_{\eta\pi}, 0)(s^-_{\pi p} - s_{\pi p})(s_{\pi p} - s^+_{\pi p})$$



Blue lines $m_{\eta\pi} = 1.6$ GeV

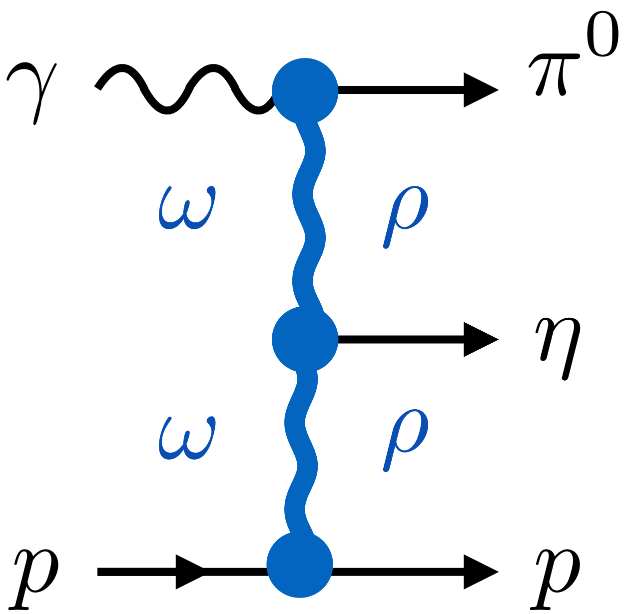
Red lines $m_{\eta\pi} = 3.0$ GeV

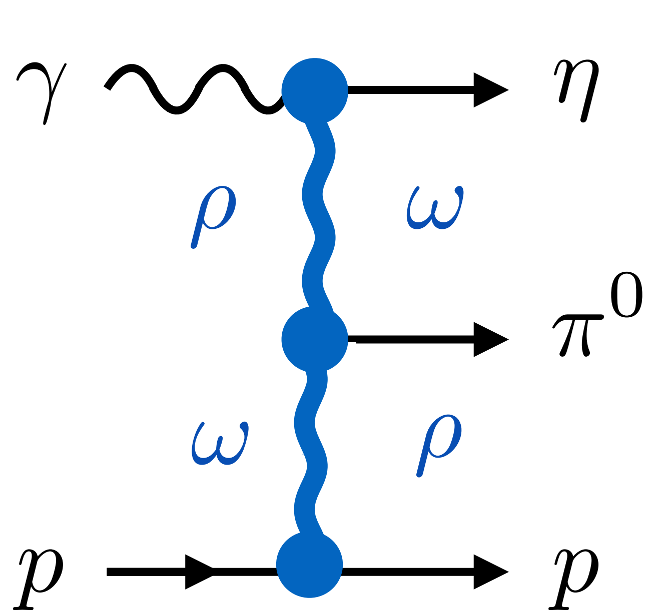
Dashed lines $t_\eta = -0.1\ \text{GeV}^2$

Solid lines $t_\eta = -1.5\ \text{GeV}^2$

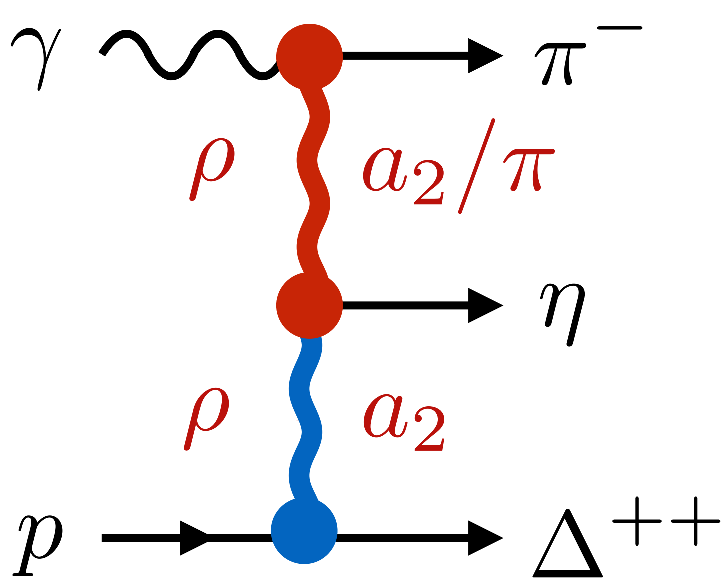
Exchanges

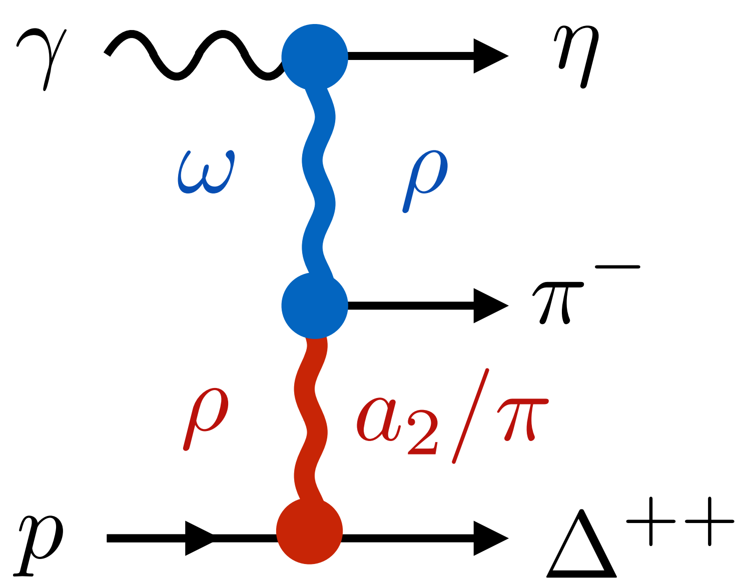
Neutral in blue
Charged in red



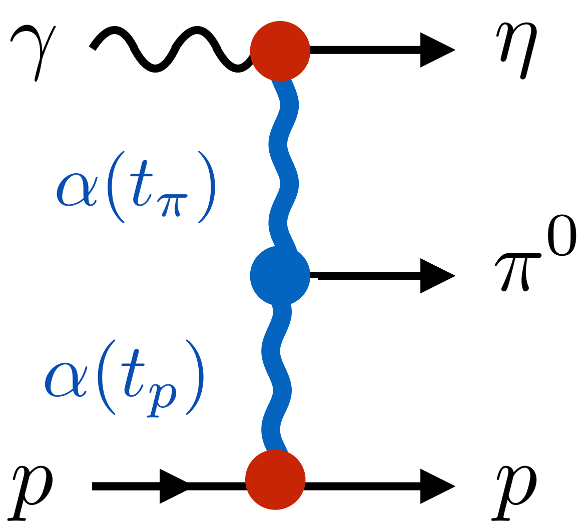


Axial-vector exchanges
b1 and h1
have been ignored



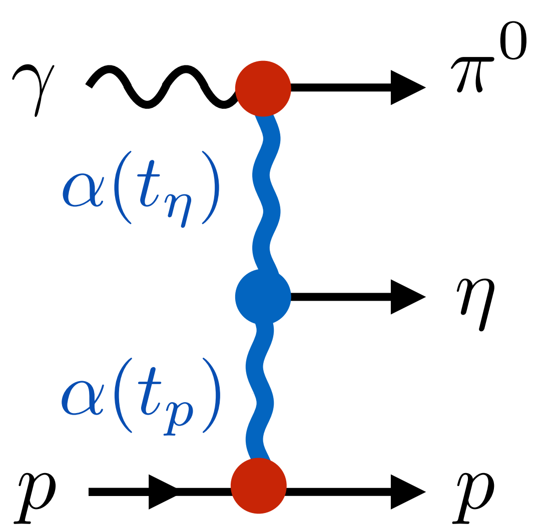


Amplitude



$$A^{\eta\pi^0} = \beta(t_\eta)\beta(t_p)$$

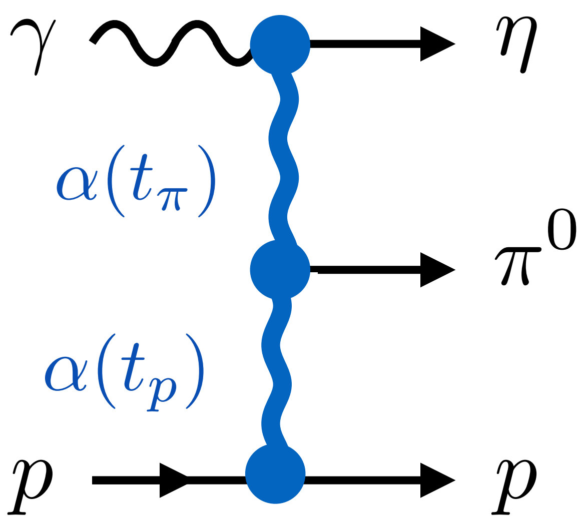
$$\left[s^{\alpha(t_\eta)} s_{\pi p}^{\alpha(t_p)-\alpha(t_\eta)} \; V(t_\eta, t_p) + V(t_p, t_\eta) \; s^{\alpha(t_p)} s_{\eta\pi}^{\alpha(t_\eta)-\alpha(t_p)}\right]$$



$$A^{\pi^0\eta} = \beta(t_\pi)\beta(t_p)$$

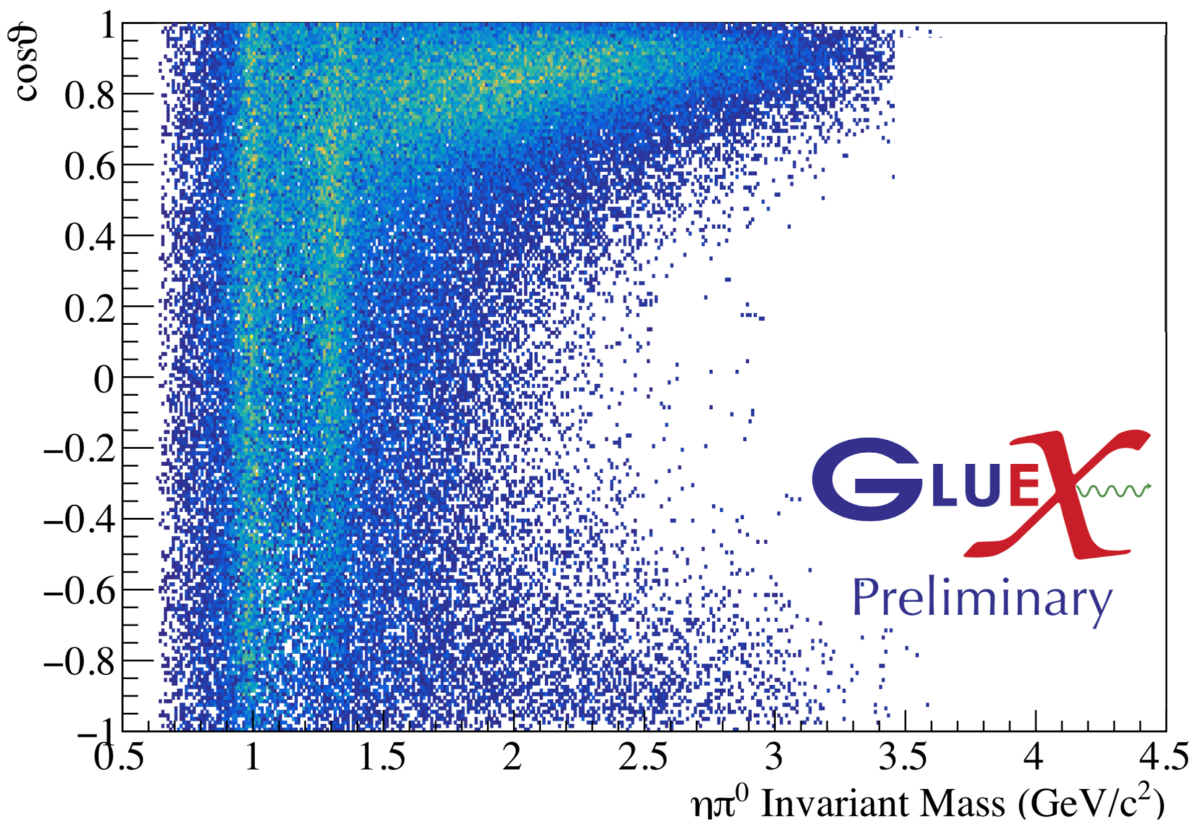
$$\left[s^{\alpha(t_\pi)} s_{\eta p}^{\alpha(t_p)-\alpha(t_\pi)} \; V(t_\pi, t_p) + V(t_p, t_\pi) \; s^{\alpha(t_p)} s_{\eta\pi}^{\alpha(t_\pi)-\alpha(t_p)}\right]$$

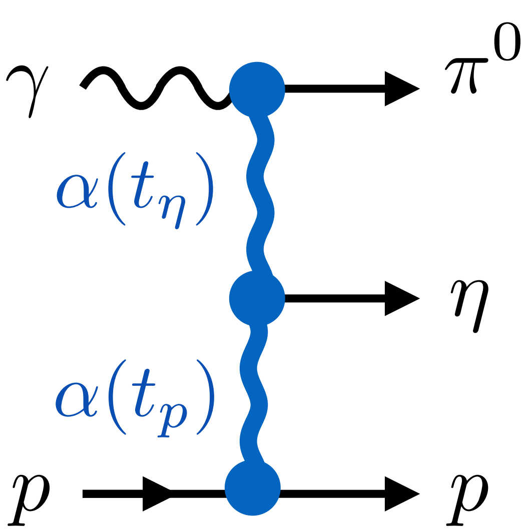
Amplitude Neutral Pion



Alpha are known and phases of beta are known

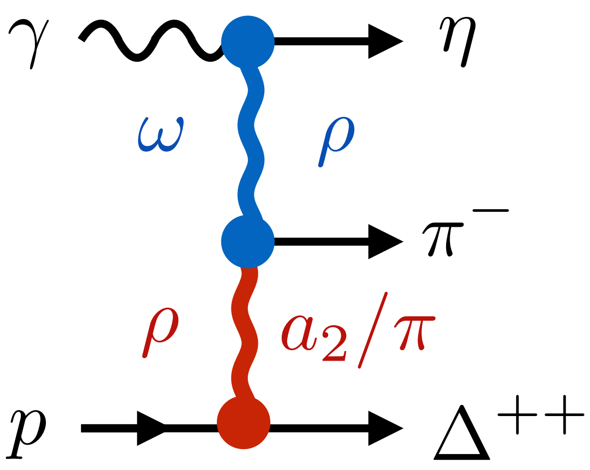
$$A^{\eta\pi^0} = \beta_1(t_\eta, t_p) s_{\pi p}^{\alpha(t_p)-\alpha(t_\eta)} + \beta_2(t_\eta, t_p) s_{\eta\pi}^{\alpha(t_\eta)-\alpha(t_p)}$$





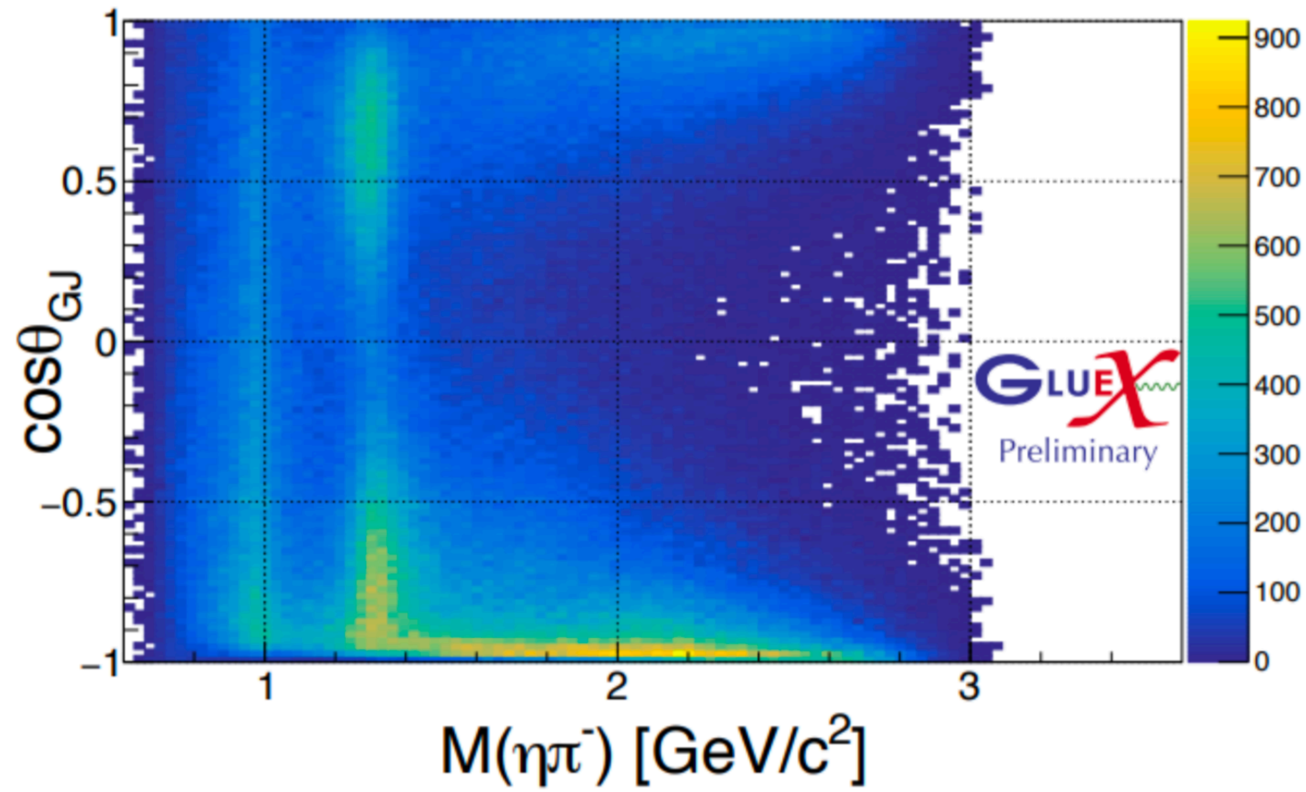
$$A^{\pi^0\eta} = \tilde{\beta}_1(t_\pi, t_p) s_{\eta p}^{\alpha(t_p)-\alpha(t_\pi)} + \tilde{\beta}_2(t_\pi, t_p) s_{\eta\pi}^{\alpha(t_\pi)-\alpha(t_p)}$$

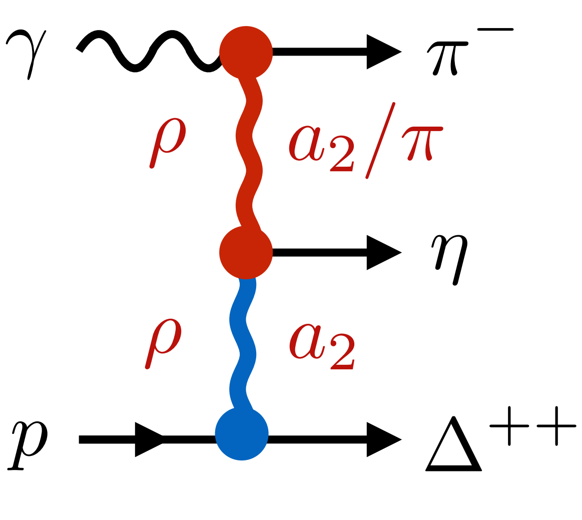
Amplitude Charged Pion



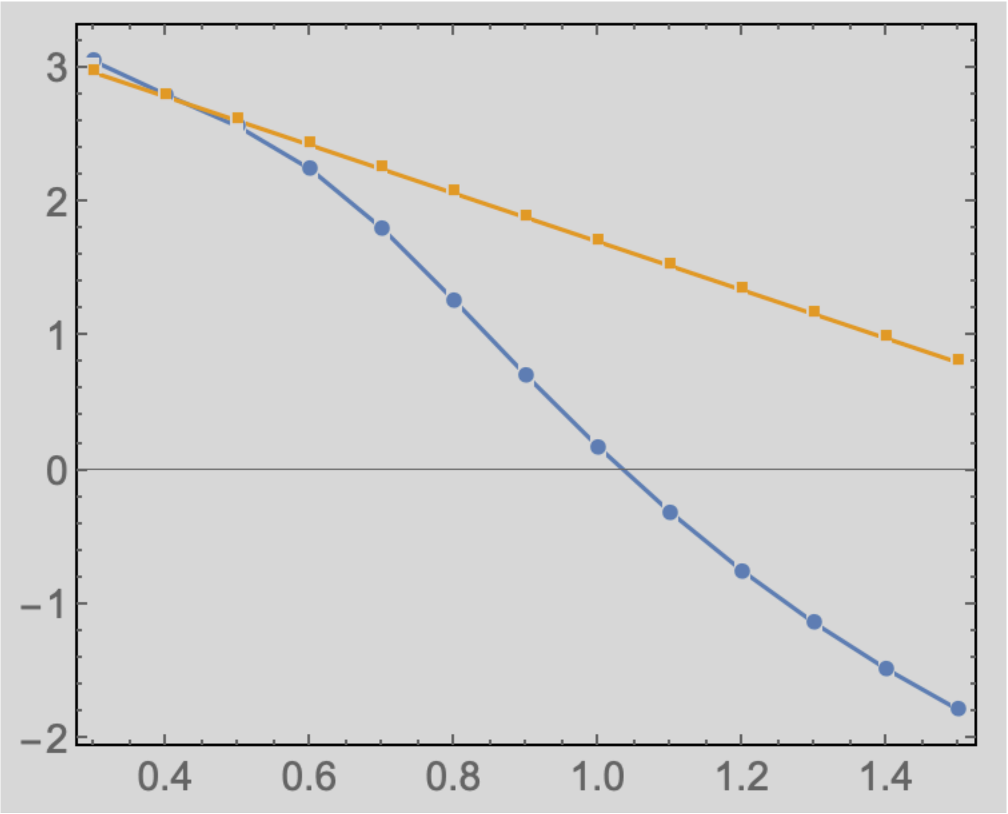
Alpha are known and phases of beta are known

$$A^{\eta\pi^-} = \beta_1(t_\eta, t_p) s_{\eta p}^{\alpha(t_p)-\alpha(t_\eta)} + \beta_2(t_\eta, t_p) s_{\eta\pi}^{\alpha(t_\pi)-\alpha(t_p)}$$
$$+ \beta_3(t_\eta, t_p) s_{\eta p}^{\alpha_\pi(t_p)-\alpha(t_\pi)} + \beta_4(t_\eta, t_p) s_{\eta\pi}^{\alpha(t_\eta)-\alpha_\pi(t_p)}$$





$$A^{\pi^-\eta} = \tilde{\beta}_1(t_\pi, t_p) s_{\eta p}^{\alpha(t_p)-\alpha(t_\pi)} + \tilde{\beta}_2(t_\pi, t_p) s_{\eta\pi}^{\alpha(t_\pi)-\alpha(t_p)}$$
$$+ \tilde{\beta}_3(t_\pi, t_p) s_{\eta p}^{\alpha(t_p)-\alpha_\pi(t_\pi)} + \tilde{\beta}_4(t_\pi, t_p) s_{\eta\pi}^{\alpha_\pi(t_\pi)-\alpha(t_p)}$$


3
2
1
0
−1
−2
0.4
0.6
0.8
1.0
1.2
1.4