$\gamma P \to K^+K^-P$

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1 Fitting result

2 Assumption about the kinematic factor

The momentum of outgoing particles are k_1, k_2 and p for K^+, K^- and proton, respectively. The γK^+K^- vertex is chosen with

$$V^\mu = k^\mu \epsilon \cdot (k_1 - k_2) - q \cdot (k_1 - k_2)\epsilon^\mu, \tag{1}$$

the factor from proton proton vertex can be written with

$$K^\mu = \bar{u}(p_2)\sigma_{\mu\nu}(p_1 - p_2)^\nu u(p_1). \tag{2}$$

Hence the amplitude is

$$\begin{aligned}\mathcal{M} = & K^\mu \cdot V_\mu [B_5(AB, A1, 12, 23, B3) + B_5(1B, A1, A2, 23, B3) \\ & + B_5(A3, A1, 12, B2, B3) + B_5(13, A1, A2, B2, B3)].\end{aligned} \tag{3}$$

The double Regge limit means $s_{AB}, s_{12}, s_{23} \to \infty$.

$$\begin{aligned}B_5(AB, A1, 12, 23, B3) = & B_4(AB, A1)B_4(23, B3 - A1)_1F_1(A1; 1 + A1 - B3; z) \\ & + B_4(AB, B3)B_4(12, A1 - B3)_1F_1(B3; 1 + B3 - A1; z),\end{aligned} \tag{4}$$

where $z = \frac{12\cdot 23}{AB}$. When $z \to 0$, ${}_1F_1 \to 1$; when $z \to -\infty$, $\mathcal{M} \to B_4(12, A1)B_4(23, B3)$.

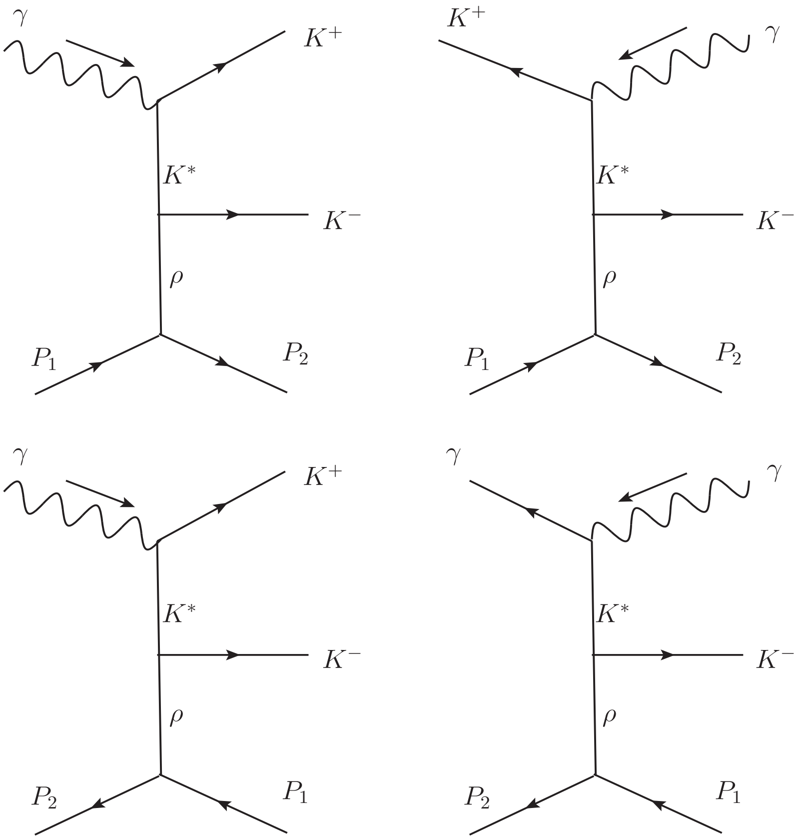

Figure 1: Four diagrams of the double Regge limit $s_{AB}, s_{12}, s_{23} \to \infty$.

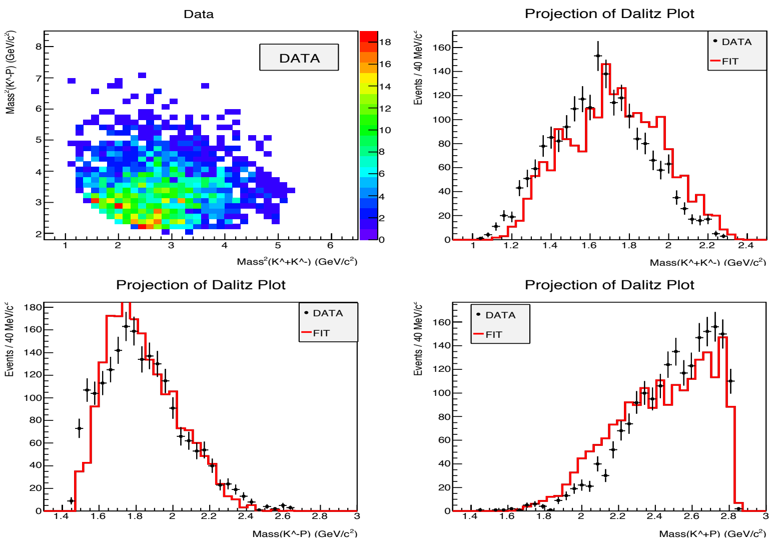

Figure 2: Fitting with Eq. (3). The trajectories are: $\alpha_{ab} = -0.19 + 0.90s + 0.15i\sqrt{s-(ma+mb)^2}$, $\alpha_{a1} = 0.46 + 0.70s + 0.14i$, $\alpha_{12} = 0.60 + 0.99s + 0.22i\sqrt{s-(m1+m2)^2}$, $\alpha_{23} = -0.15+0.99s+0.44i\sqrt{s-(m2+m3)^2}$, $\alpha_{b3} = 0.30 + 0.75s + 0.20i$.

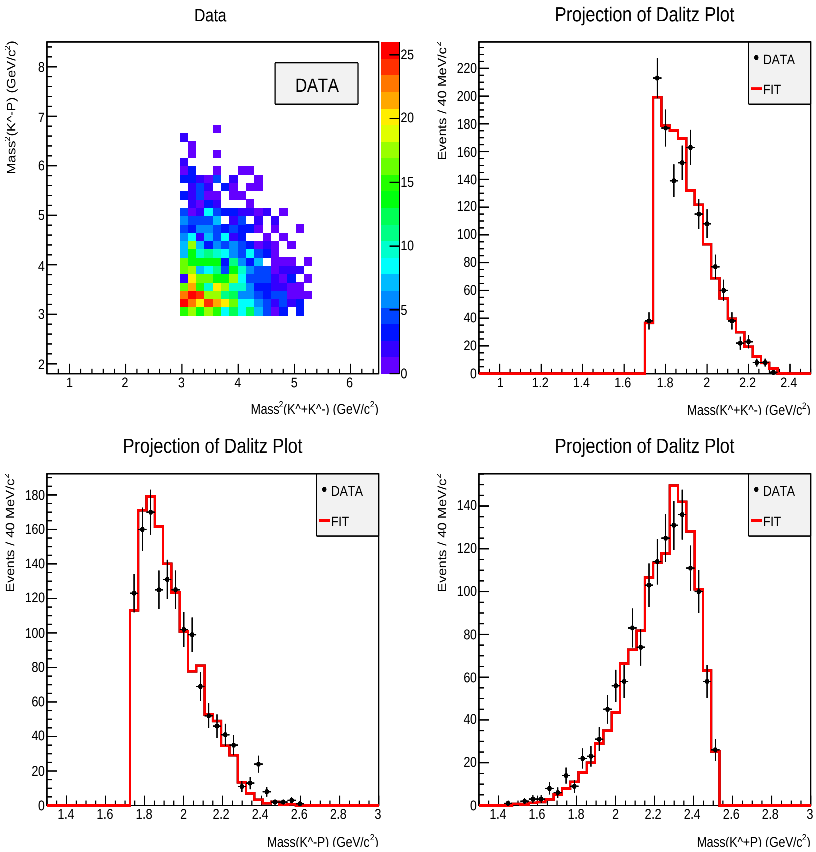

Figure 3: Fitting result of $z \to -\infty$. The trajectories are: $\alpha_{a1} = 0.20 + 0.75s$, $\alpha_{12} = 0.98 + 0.79s + 0.45i\sqrt{s - (m1 + m2)^2}$, $\alpha_{23} = -0.9 + 0.70s + 0.32i\sqrt{s - (m2 + m3)^2}$, $\alpha_{b3} = 0.30 + 0.99s$.

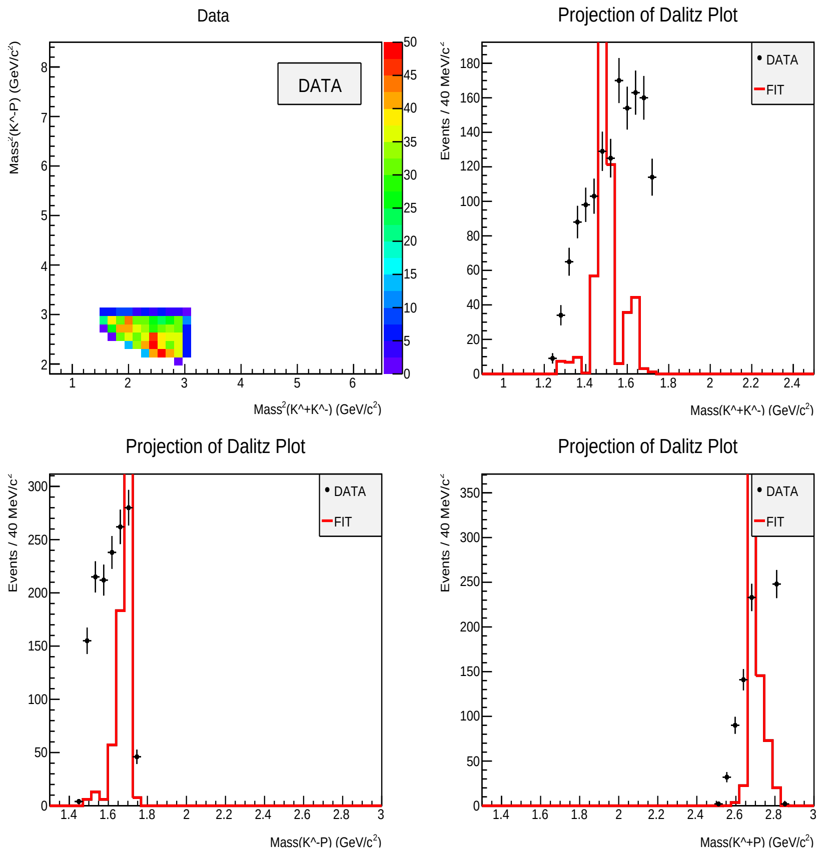

Figure 4: Fitting result of $z \to 0$. The trajectories are: $\alpha_{a1} = 0.35 + 0.84s$, $\alpha_{12} = 0.12 + 0.76s + 0.18i\sqrt{s-(m1+m2)^2}$, $\alpha_{23} = -0.52 + 0.85s + 0.24i\sqrt{s-(m2+m3)^2}$, $\alpha_{b3} = 0.47 + 0.86s$.