Dispersive analysis of $\omega \to 3\pi$
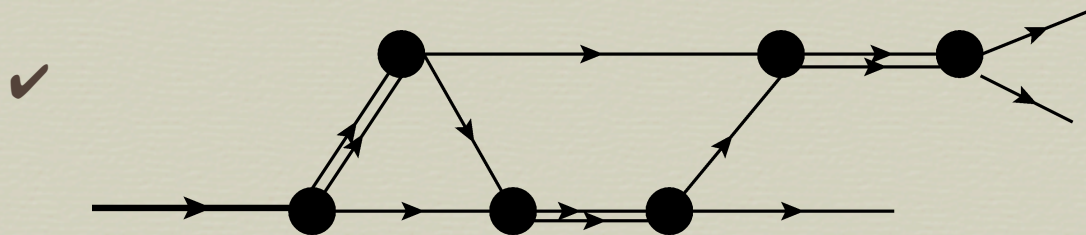

- Disc $F(s) = \rho(s) \, t^*(s)(F(s) + \hat{F}(s))$

$$\hat{F}(s) = 3 \int_{t^-(s)}^{t^+(s)} \frac{dt}{k(s)}(1 - z_s^2)F(t)$$

- $t(s)$ is the $\pi\pi$ scattering amplitude

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Bastian et.al. [Niecknig:2012sj]
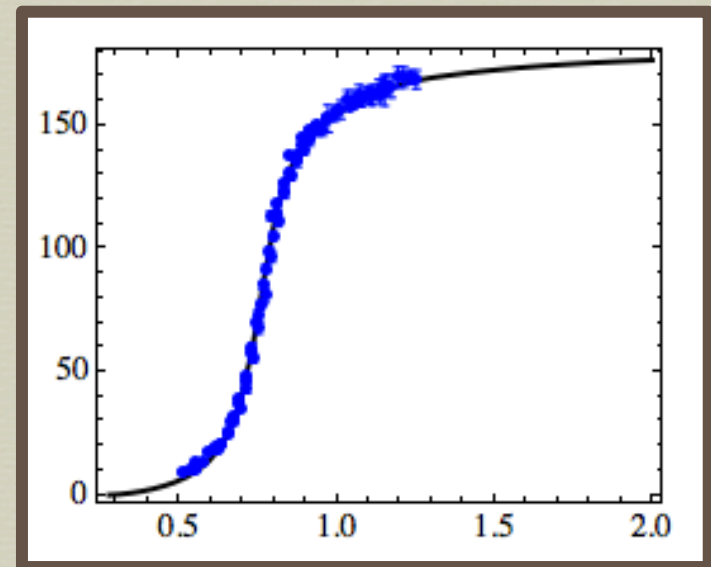
✔ elastic unitarity

✔ $F(s) = \Omega(s)\, g(s)$

✔ $\Omega(s) = \exp\left(\dfrac{s}{\pi} \displaystyle\int_{4m_\pi^2}^{\infty} \dfrac{ds'}{s'} \dfrac{\delta(s')}{s' - s}\right)$

✔ assume $\delta(s \to \infty) \to \pi$

✔ $F(s) = \Omega(s)\left(\displaystyle\sum_{i=0}^{n-1} \alpha_i\, s^i + \dfrac{s^n}{\pi} \int_{4m_\pi^2}^{\Lambda^2} \dfrac{ds'}{s'^n} \dfrac{\sin(\delta(s'))\hat{F}(s')}{|\Omega(s')|(s' - s)}\right)$
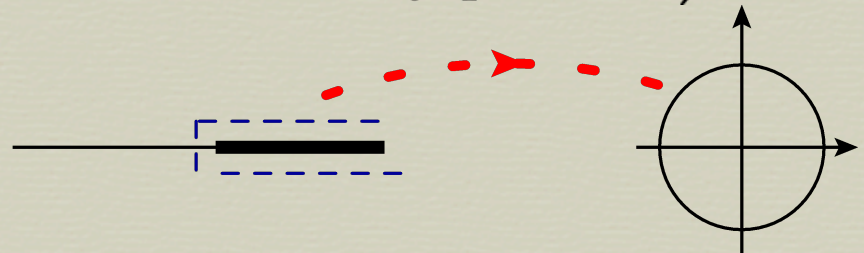
$\Lambda = 1.9 \text{ GeV}$

Our way

✔ $F(s) = \Omega_{el}(s)\left(G_{el}(s) + \sum a_i w^i\right)$

✔ $\Omega_{el}(s) = \exp\left(\dfrac{s}{\pi}\displaystyle\int_{4m_\pi^2}^{4m_K^2} \dfrac{ds'}{s'}\dfrac{\delta(s')}{s'-s}\right)$

✔ no assumption about $\delta(s \to \infty)$

✔ $F(s) = \Omega_{el}(s)\left(\displaystyle\int_{4m_\pi^2}^{4m_K^2}\dfrac{ds'}{\pi}\dfrac{\sin(\delta(s'))\hat{F}(s')}{|\Omega_{el}(s')|(s'-s)} + \sum_{i=1}^{n} a_i\,\omega^i(s)\right)$

✔ $\omega(s)$ is a conformal map
of inelastic contributions

It took us some time to find it...

✗ $F(s) = t(s)(G(s) + \sum a_i \omega^i)$

$F(s) = t(s)G(s) + \sum a_i \omega^i$

need to neglect l.h. cuts
in Disc $G(s)$

≈ $F(s) = \int_{4m_\pi^2}^{4m_K^2} \frac{ds'}{\pi} \frac{\text{Disc F(s)}}{s' - s} + \sum a_i \omega^i$ - problems with a cut-off

- an additional integral [homogeneous part]

☑ $F(s) = \Omega_{el}(s)\, G_{el}(s) + \sum a_i \omega^i$

☑ ☑ $F(s) = \Omega_{el}(s)\, (G_{el}(s) + \sum a_i w^i)$