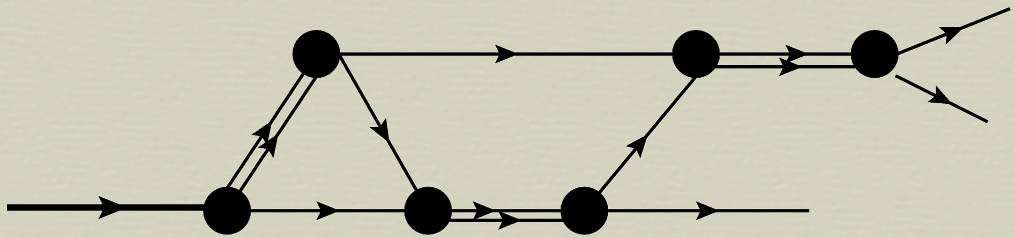
# Dispersive analysis of $\omega \to 3\pi$

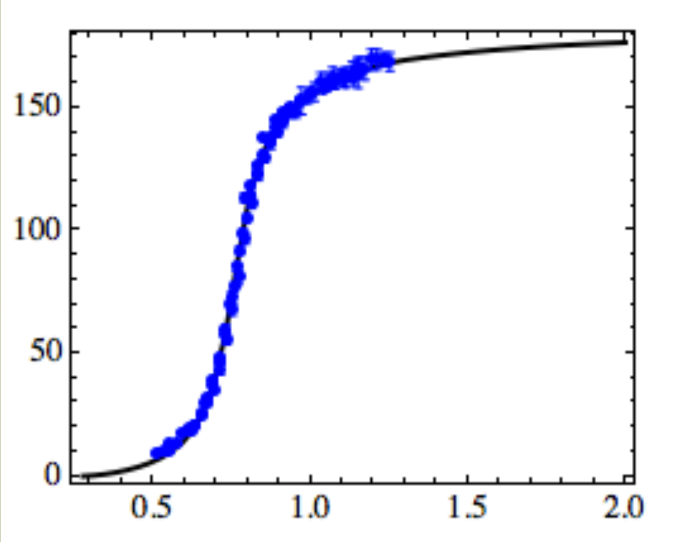
- ✔ 
- ✔ $\mathrm{Disc}\, F(s) = \rho(s)\, t^*(s)(F(s) + \hat{F}(s))$

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

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

# Bastian et.al. [Niecknig:2012sj]

- ✔ elastic unitarity
- ✔ $F(s) = \Omega(s)\, g(s)$
- ✔ $\Omega(s) = \exp\left(\frac{s}{\pi}\int_{4m_\pi^2}^{\infty} \frac{ds'}{s'}\frac{\delta(s')}{s'-s}\right)$
- ✔ assume $\delta(s \to \infty) \to \pi$

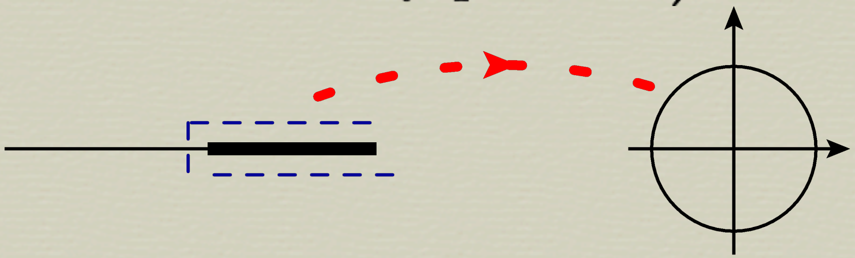



- ✔ $F(s) = \Omega(s)\left(\sum_{i=0}^{n-1}\alpha_i\, s^i + \frac{s^n}{\pi}\int_{4m_\pi^2}^{\Lambda^2}\frac{ds'}{s'^n}\frac{\sin(\delta(s'))\hat{F}(s')}{|\Omega(s')|(s'-s)}\right)$

$\Lambda = 1.9\ \text{GeV}$

# Our way

- $F(s) = \Omega_{el}(s)\left(G_{el}(s) + \sum a_i w^i\right)$
- $\Omega_{el}(s) = \exp\left(\frac{s}{\pi}\int_{4m_\pi^2}^{4m_K^2}\frac{ds'}{s'}\frac{\delta(s')}{s'-s}\right)$
- no assumption about $\delta(s \to \infty)$
- $F(s) = \Omega_{el}(s)\left(\int_{4m_\pi^2}^{4m_K^2}\frac{ds'}{\pi}\frac{\sin(\delta(s'))\hat{F}(s')}{|\Omega_{el}(s')|(s'-s)} + \sum_{i=1}^{n} a_i\,\omega^i(s)\right)$
- $\omega(s)$ is a conformal map of inelastic contributions



- Correct asym. behavior $F(s \to \infty) \to 0$ imposed by $a_i$

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