

Rescattering effects and Calculation of the survival factor in pp scattering processes

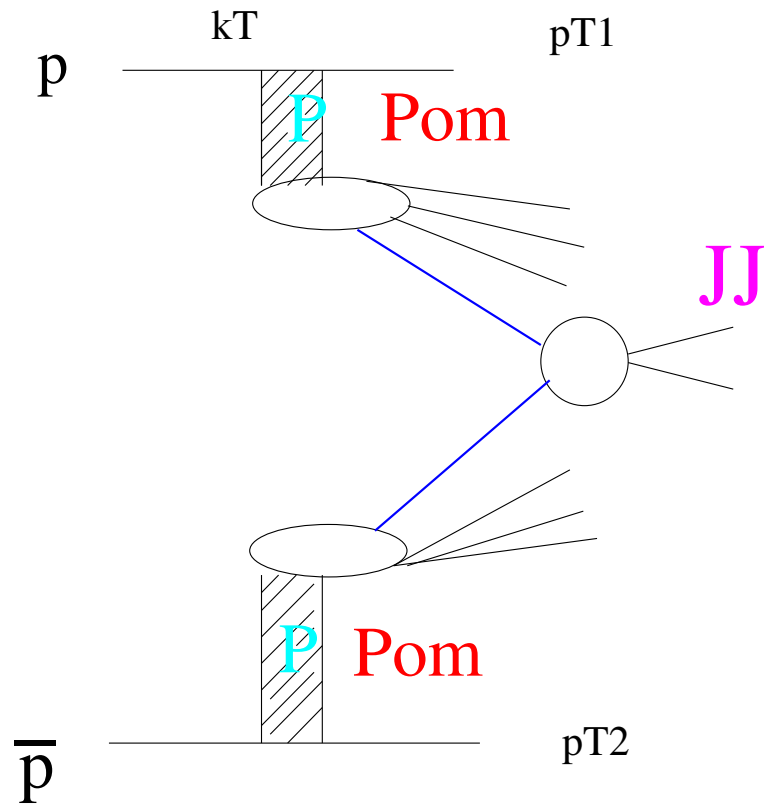
Workshop on Hard Diffraction at LHC

October 18-19, 2007, Cracow

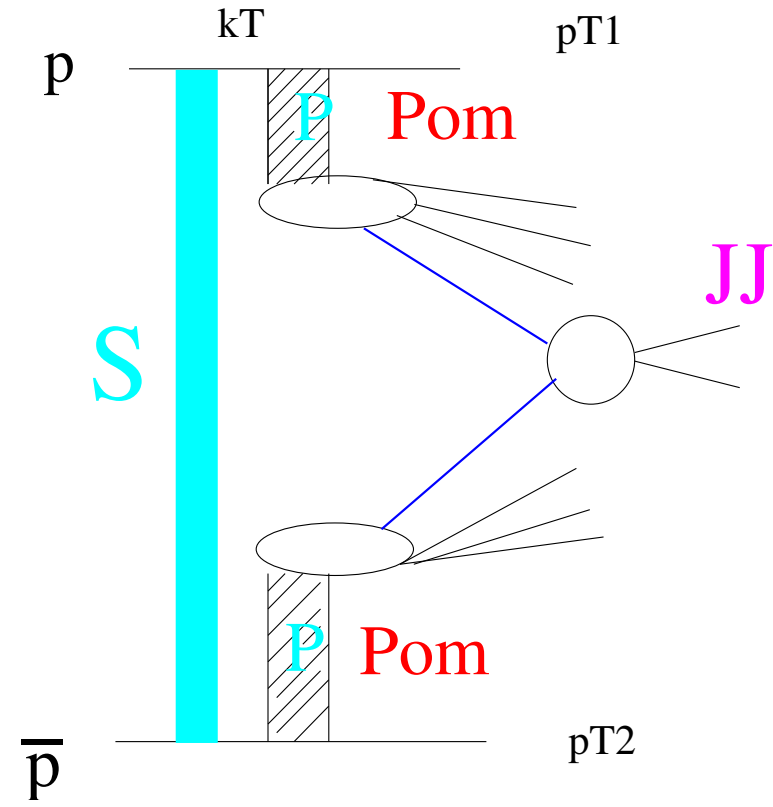
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Survival probability



A_{hard}



$A_{rescat} = i A_{el} \otimes A_{hard}$

Survival probability

$$S^2 = \frac{\int |\mathcal{A}_{hard} + \mathcal{A}_{rescat}|^2}{\int |\mathcal{A}_{hard}|^2} = \frac{\int d\vec{b} |\mathcal{A}_{hard}(s, b)|^2 \overbrace{|1 + i\mathcal{A}_{el}(s, b)|^2}^{\exp[-\Omega(b)]}}{\int d\vec{b} |\mathcal{A}_{hard}(s, b)|^2}$$

- hard amplitude \mathcal{A}_{hard}

- factorization of the t -dependence at small t ($\equiv -p_T^2$)

$$\mathcal{A}_{hard}(\vec{p}_{T1}, \vec{p}_{T2}, \dots) = \beta_{hard}(t_1) \beta_{hard}(t_2) A_0(\sqrt{s}, y, M)$$

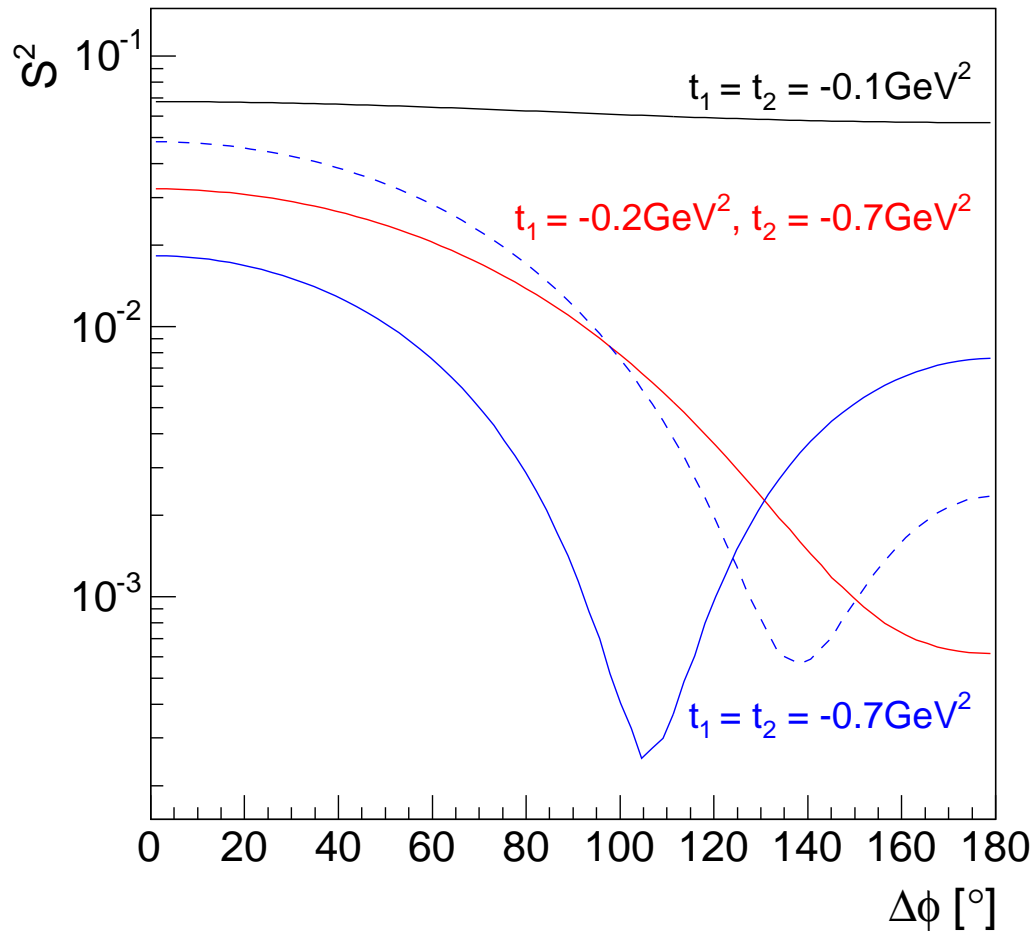
⇒ survival probability factor independent on the hard interaction

- Key ingredients:

- models of elastic scattering amplitude \mathcal{A}_{el}

- models of transverse distribution of nucleon constituents

Survival probability - $\Delta\phi_{p\bar{p}}$ dependence



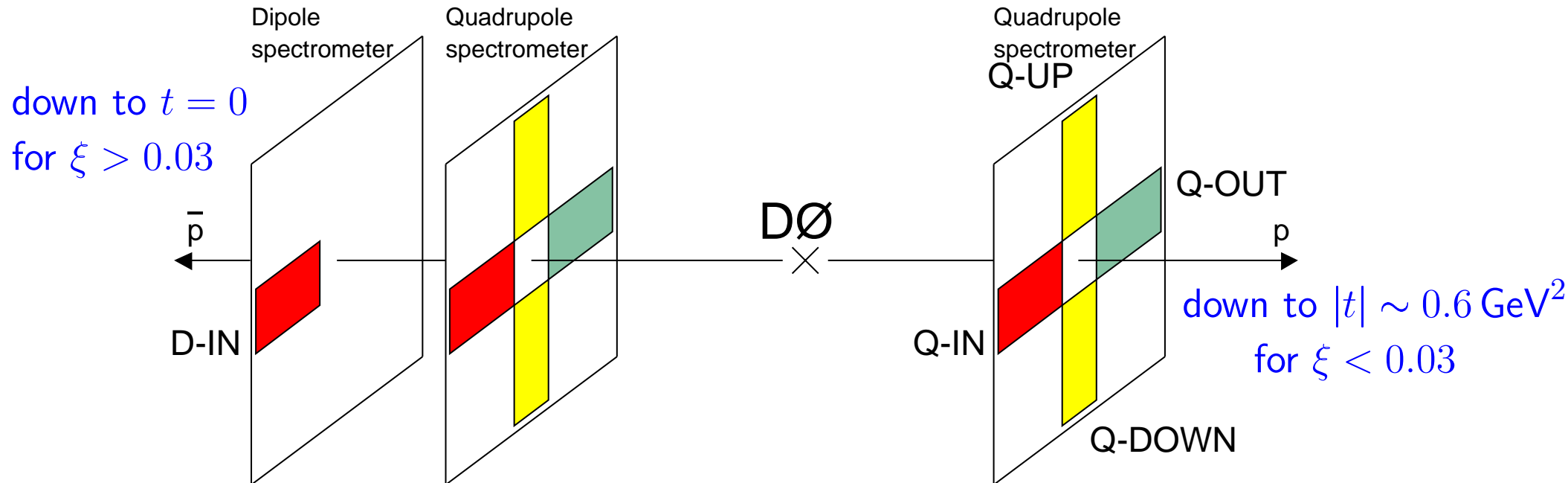
- rich structure in $\Delta\phi$
V. A. Khoze, A. D. Martin and M. Ryskin, Eur. Phys. J. **C24** (2002) 581
- the same origin as the diffractive dips in $d\sigma_{el}/dt$
- the position of the dip is sensitive to the details of the model
- This is a general feature of all pomeron based models

There is no $\Delta\Phi$ dependence in SCI model

DØ Forward Proton Detector

Kupčo, Peschanski, Royon, Phys. Lett. B606 (2005) 139

- Forward Proton Detector installed by DØ provides an unique opportunity to measure the $\Delta\phi$ dependence of the hard diffractive production



Dipole-Quadrupole combination

D-IN & Q-IN, D-IN & Q-OUT

D-IN & Q-UP or D-IN & Q-DOWN

- asymmetric cuts in t

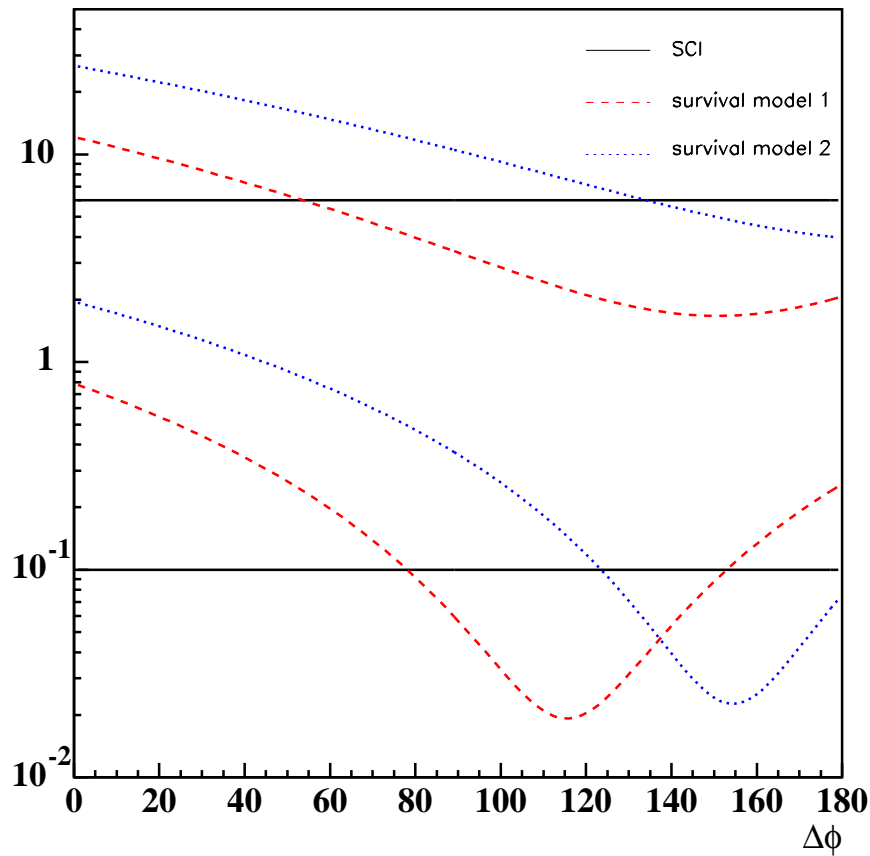
Quadrupole-Quadrupole combination

same side, opposite side

middle (90°) configuration

- symmetric cuts in t

Results for double diffractive dijet production



After simulation of
FPD acceptance:

- dijet production with $p_T > 5$ GeV at Tevatron
 - upper plots: $|t_p| > 0.6$, $|t_{\bar{p}}| > 0.1$ GeV²
 - lower plots: $|t_p| > 0.5$, $|t_{\bar{p}}| > 0.5$ GeV²
- Pomeron models
 - POMWIG interfaced with the calculation of survival probability

| Config. | model | $N_{90}/2 \times N_{SS}$ | N_{OS}/N_{SS} |
|---------|-----------|--------------------------|-----------------|
| Quad. | SCI | 1.3 | 1.1 |
| + | P-Model 1 | 0.36 | 0.18 |
| Dip. | P-Model 2 | 0.47 | 0.20 |
| Quad. | SCI | 1.4 | 1.2 |
| + | P-Model 1 | 0.14 | 0.31 |
| Quad. | P-Model 2 | 0.20 | 0.049 |