Charge exchange reaction at high energies

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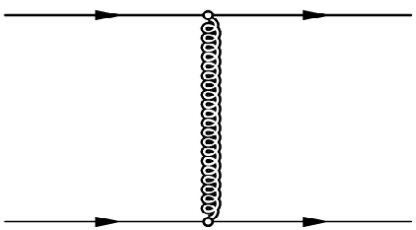
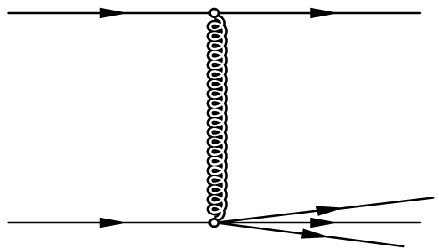
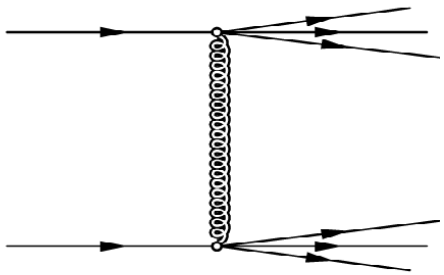
Diffractive event topologies at LHC energies



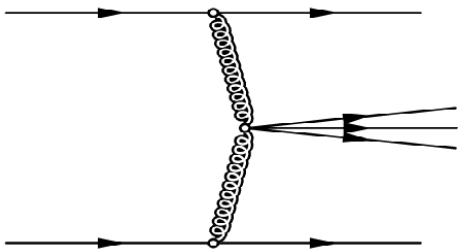
elast. scattering



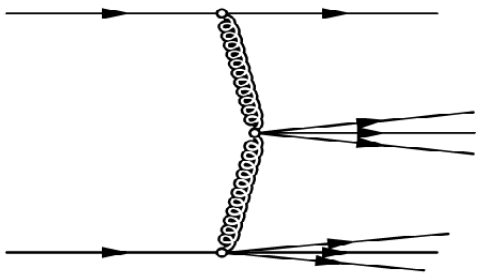
single diff. diss.



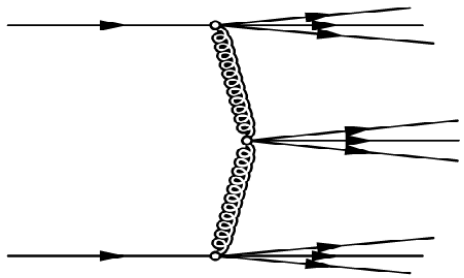
double diff. diss.



central diff.



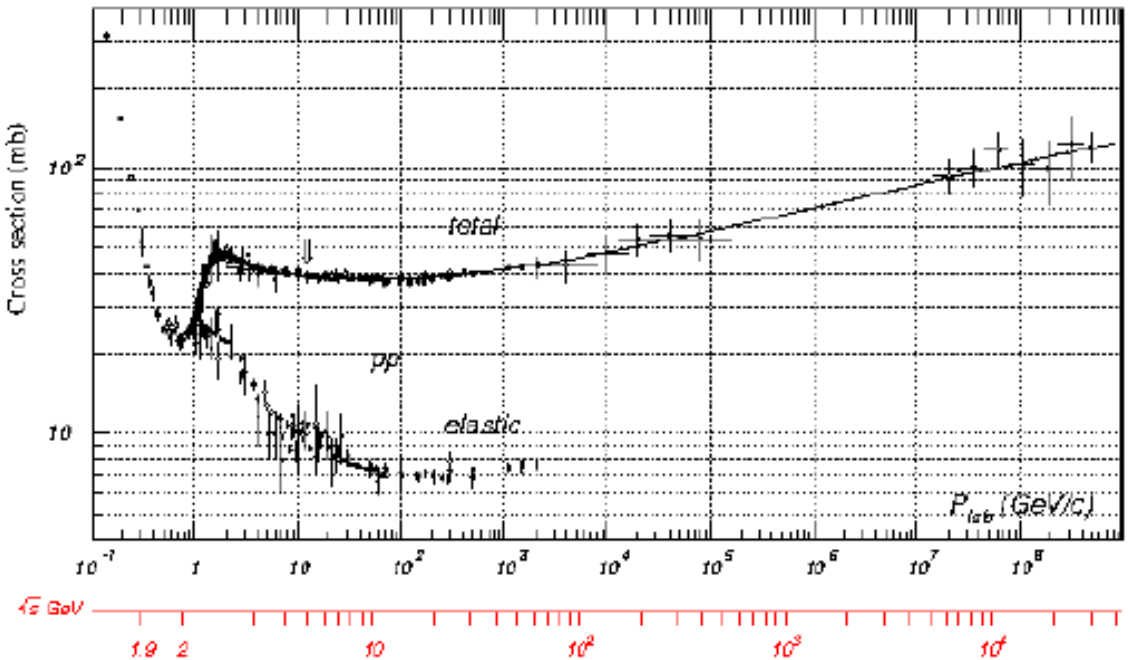
central diff./single diss.



central diff./double diss.

- Reggeon-Pomeron exchanges contribute to these topologies
- Regge exchanges at LHC ? $\rightarrow$ *Study charge exchange react*.

Hadron-hadron cross section



pp total and elastic cross section

Donnachie-Landshoff fits: $\sigma_{tot} = X \cdot s^{0.08} + Y \cdot s^{-0.45}$

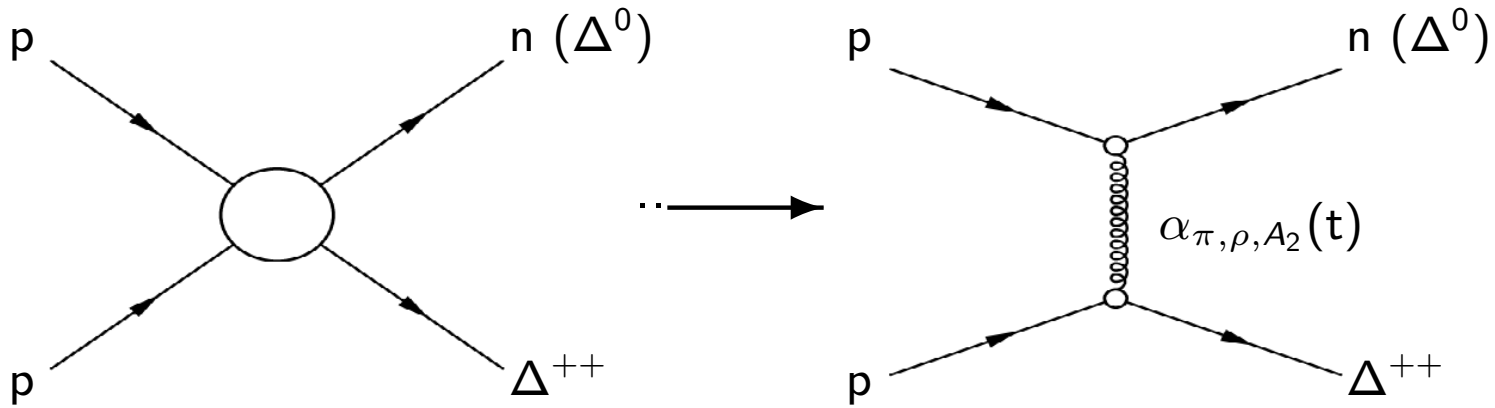
Charge exchange reactions

charge exchange reaction in proton-proton collisions:

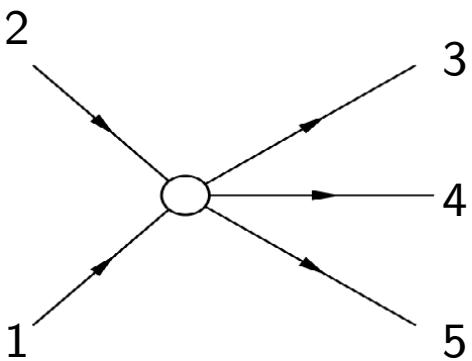
- $p\ p \rightarrow n + \Delta^{++} \rightarrow n + p\ \pi^{+}$
- $p\ p \rightarrow \Delta^{0} + \Delta^{++} \rightarrow n\ \pi^{0} + p\ \pi^{+}$
- $p\ p \rightarrow \Delta^{0} + \Delta^{++} \rightarrow p\ \pi^{-} + p\ \pi^{+}$

- need zero degree calorimeters
  + tagging of forward proton,pions
- need good pseudorapidity coverage of detectors

Two-by-two amplitude

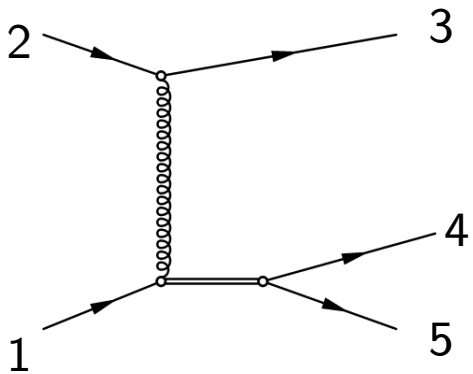


Two-by-three amplitude

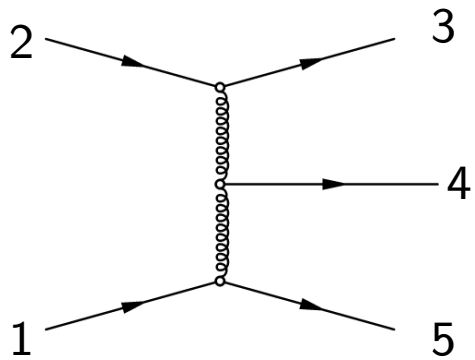


two-by-three ampl.

can be calculated
by dual amplitude



single Regge limit

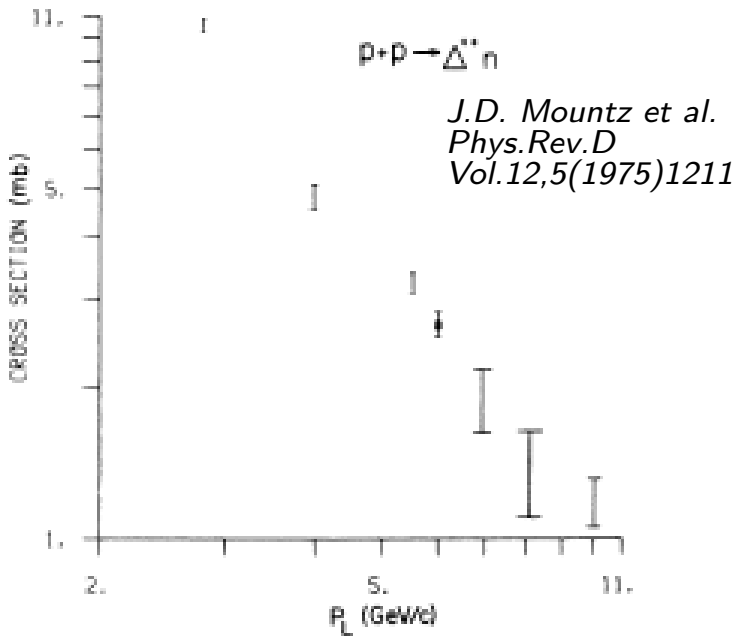


double Regge limit

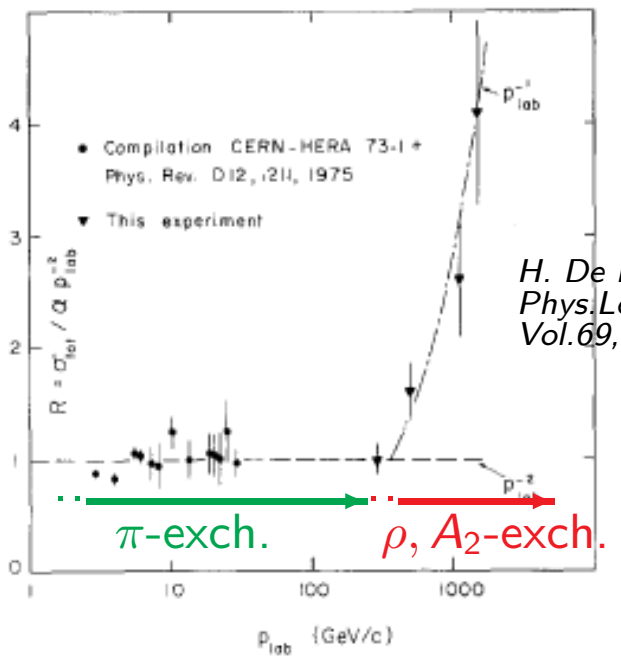
Data charge exchange reaction at low energies

The charge exchange reaction pp $\rightarrow$ n + $\Delta^{++}(1232)$ measured at

- Argonne Nat. Zero Gradient Synchrotron (p_{Lab} = 6 GeV/c)
- Intersecting Storage Ring (ISR) ($\sqrt{s}$ = 23, 31, 45, 53 GeV)



J.D. Mountz et al.
Phys.Rev.D
Vol.12,5(1975)1211



H. De Kerret et al.
Phys.Lett.B
Vol.69,3(1977)372

if Regge exchange due to pion: $\sigma \sim s^{-2}$, due to ρ, A_2: $\sigma \sim s^{-1}$

Prospects charge exchange at high energies

- RHIC Brookhaven: $\sqrt{s} = 100$-200 GeV
- LHC CERN: $\sqrt{s} = 13$-14 TeV

Table: Cross section pp $\rightarrow$ nΔ^{++}

	$\sqrt{s}$ (GeV)	σ (nb)
ISR	31	580 $\pm$90
	45	210$\pm$40
	53	170$\pm$40
RHIC	100	48.5$\pm$5.5
	200	12.2$\pm$1.3
LHC	7×10^3	(10.0$\pm$1.1) $\times10^{-3}$
	14×10^3	(2.4$\pm$0.3) $\times10^{-3}$