

DPE W production at the LHC

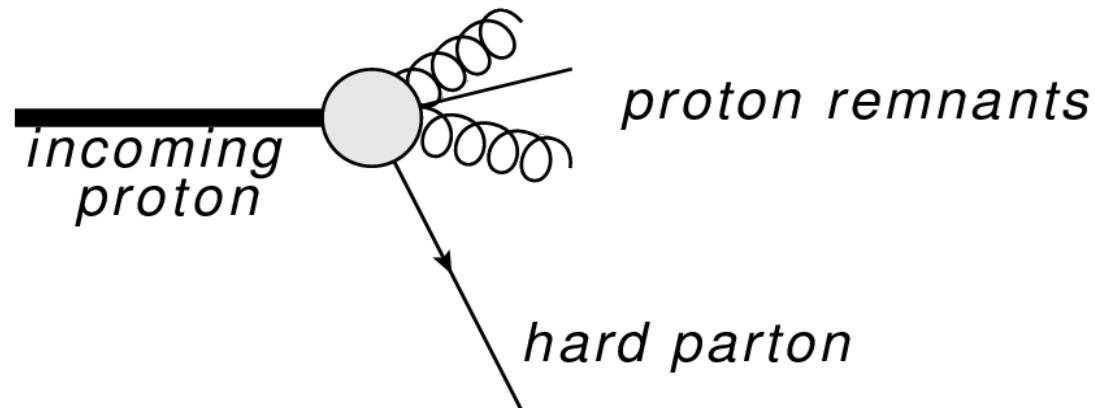
Rafał Staszewski

Workshop on QCD and diffractive physics at the LHC
28-30 November 2011



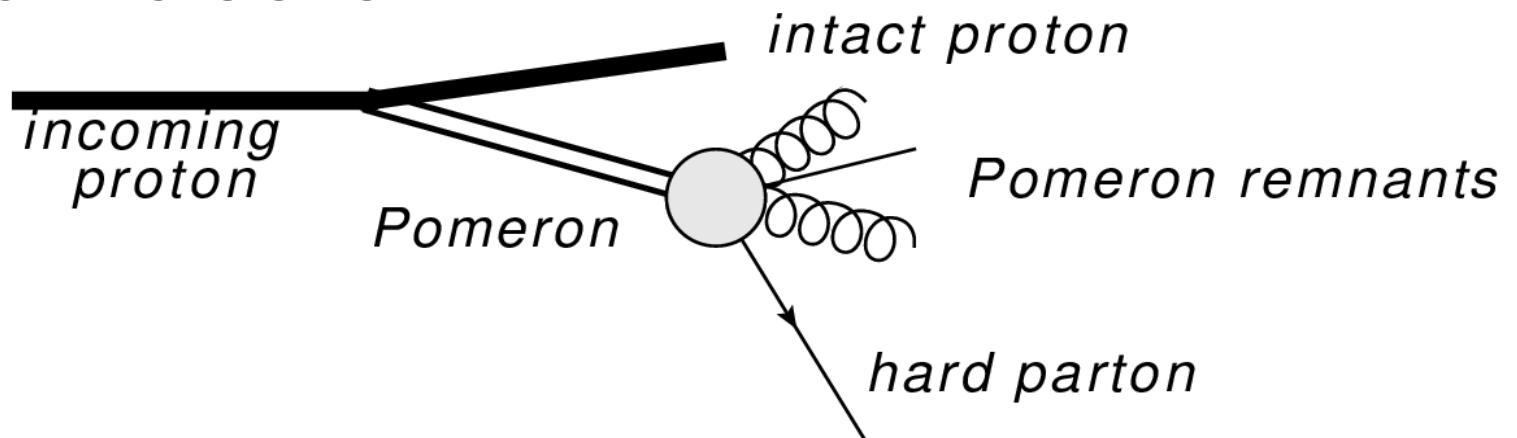
Hard diffractive proton interaction

Non-diffractive interaction



x – fraction of proton momentum carried by parton

Diffractive interaction



x – fraction of proton momentum carried by pomeron
 b - fraction of pomeron momentum carried by parton

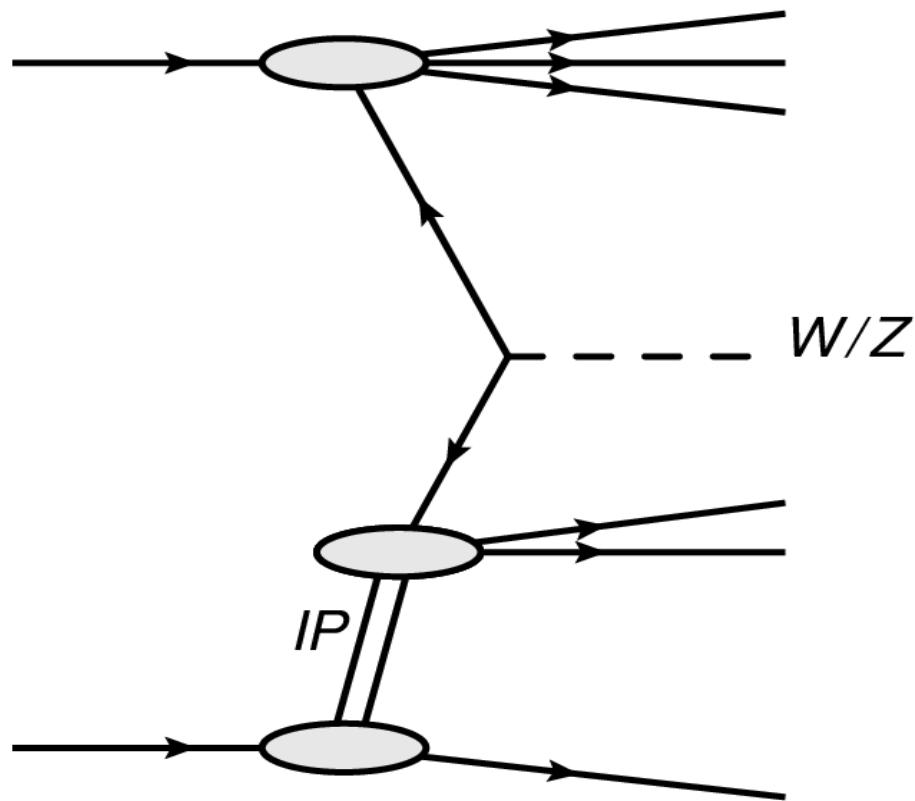
Diffractive Proton Structure

- Similar to normal PDF
- Additional ξ dependence
- Mainly gluons
- Quarks – charge and flavour symmetry:

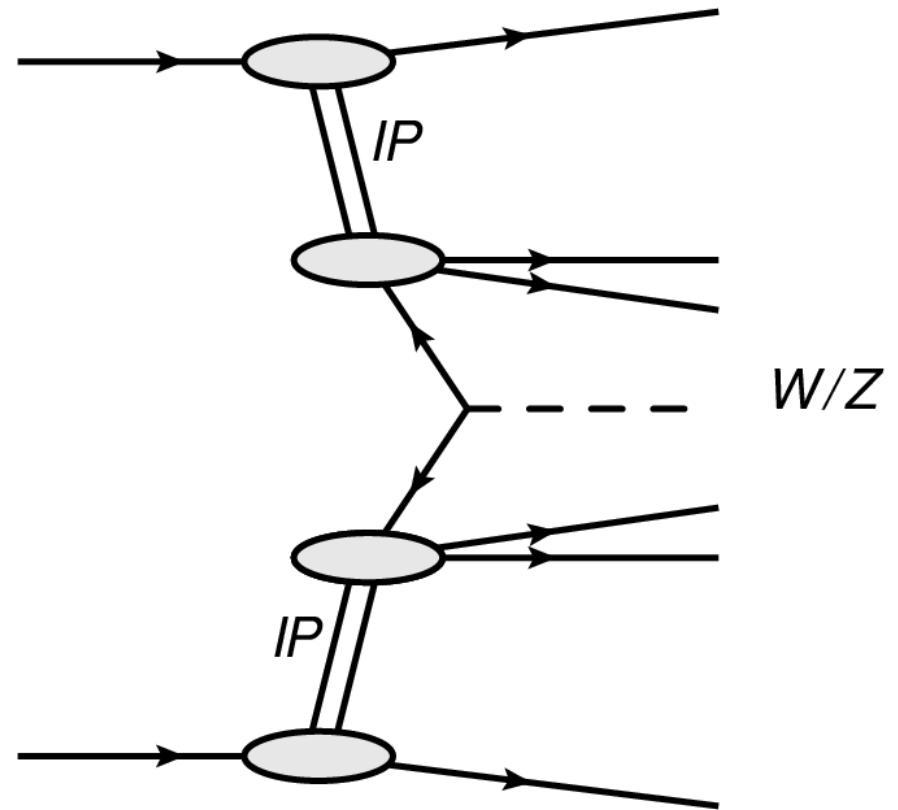
$$u = d = \bar{u} = \bar{d} = \bar{s}$$

Diffractive W production

Single Diffraction

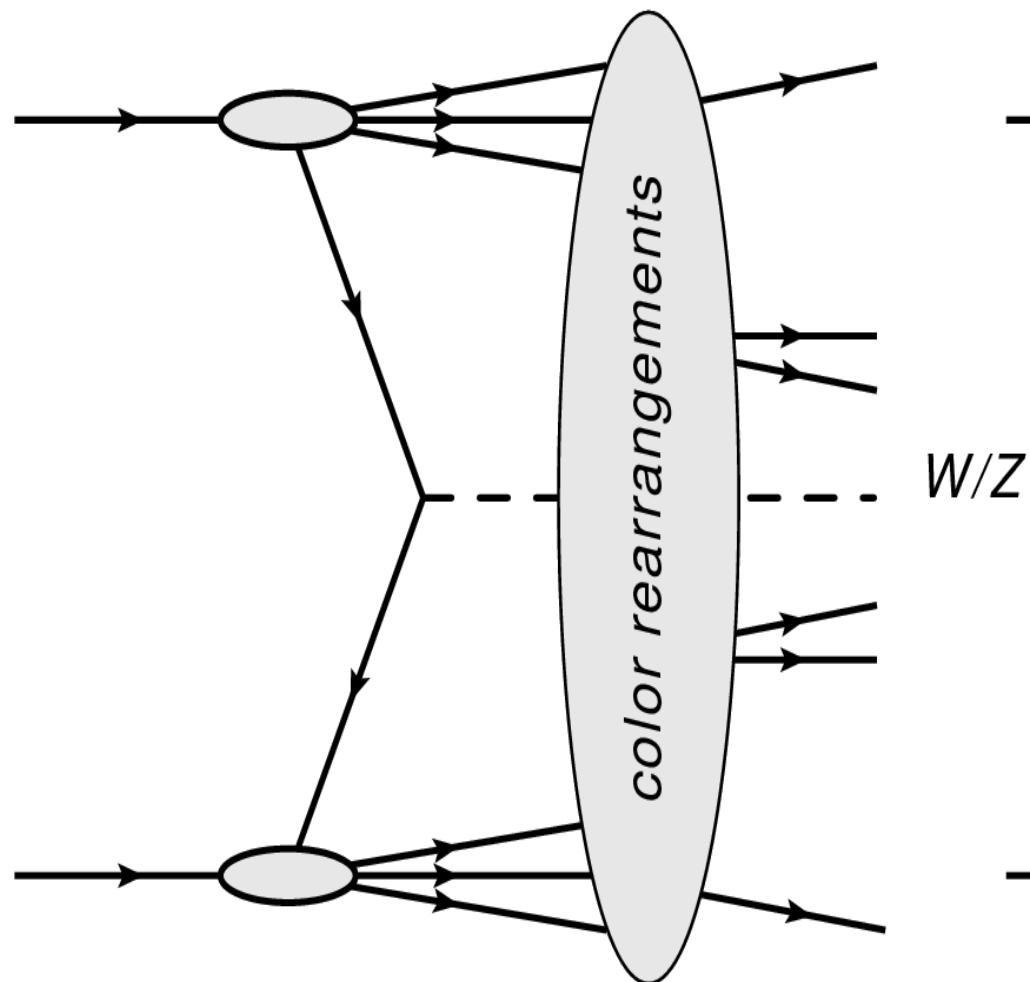


Double Pomeron Exchange

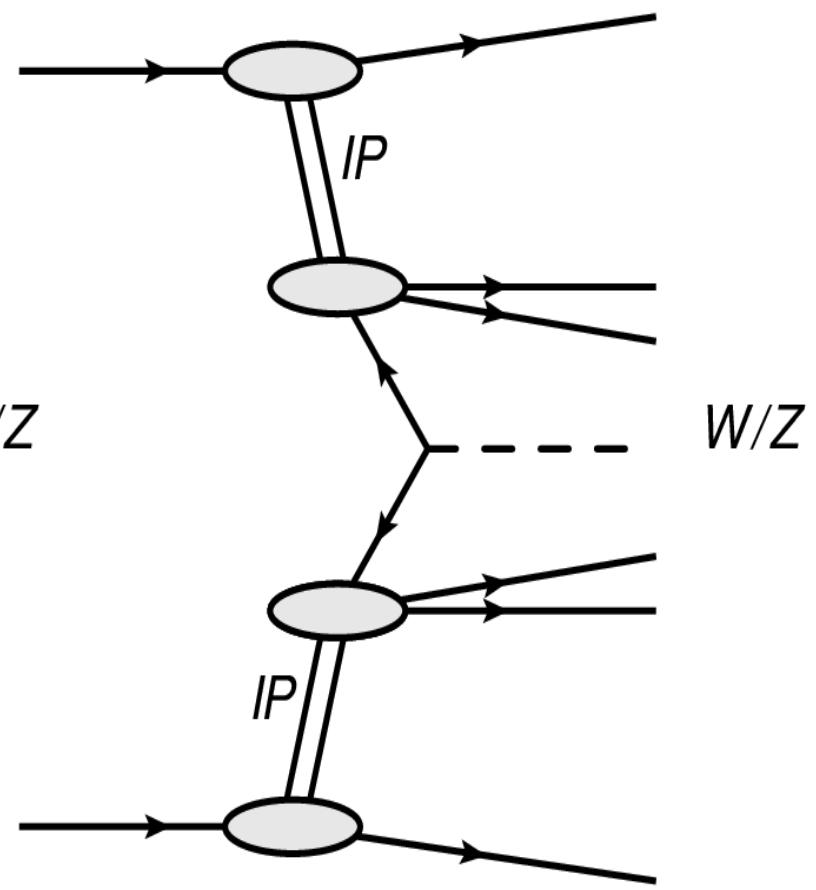


Diffraction mechanisms

Soft Color Interactions



Double Pomeron Exchange



Charge asymmetry in DPE

Asymmetry :

$$A = \frac{N_+ - N_-}{N_+ + N_-}$$

- In Pomeron model

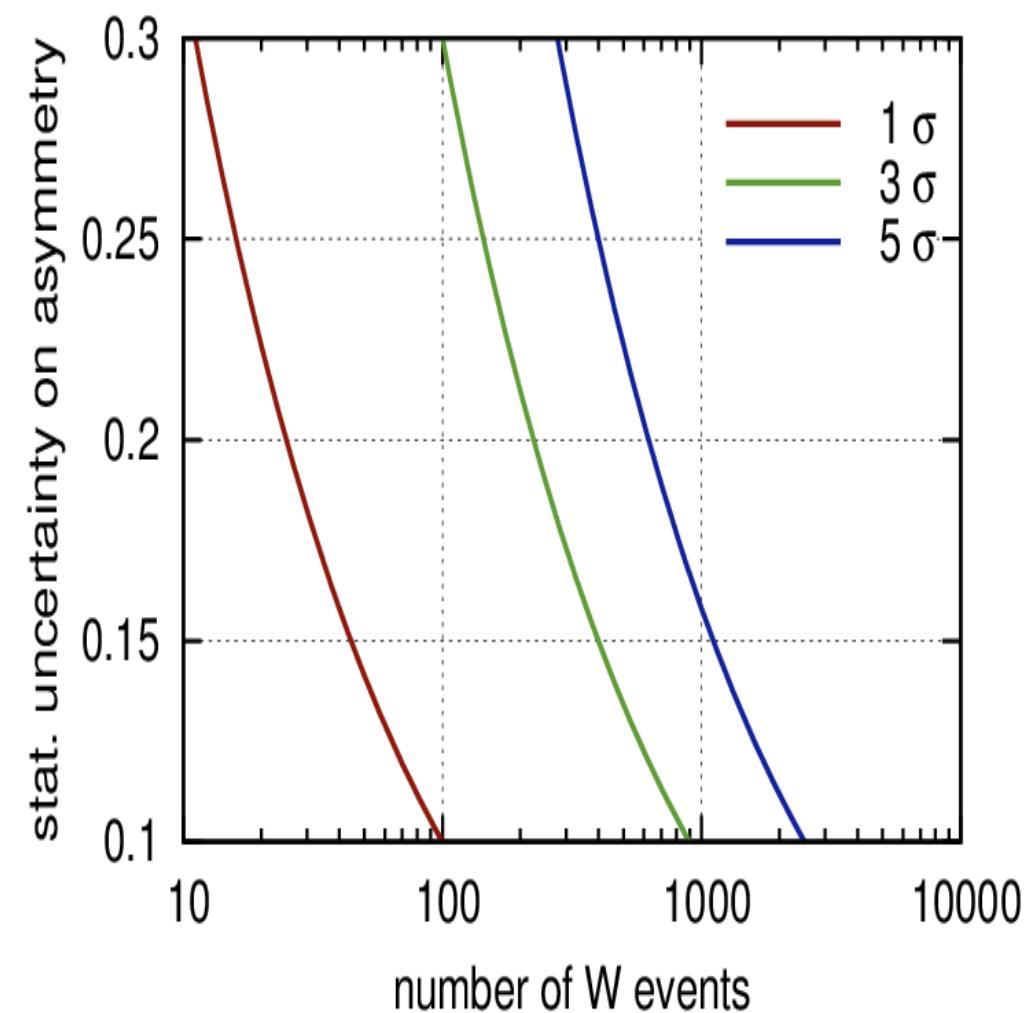
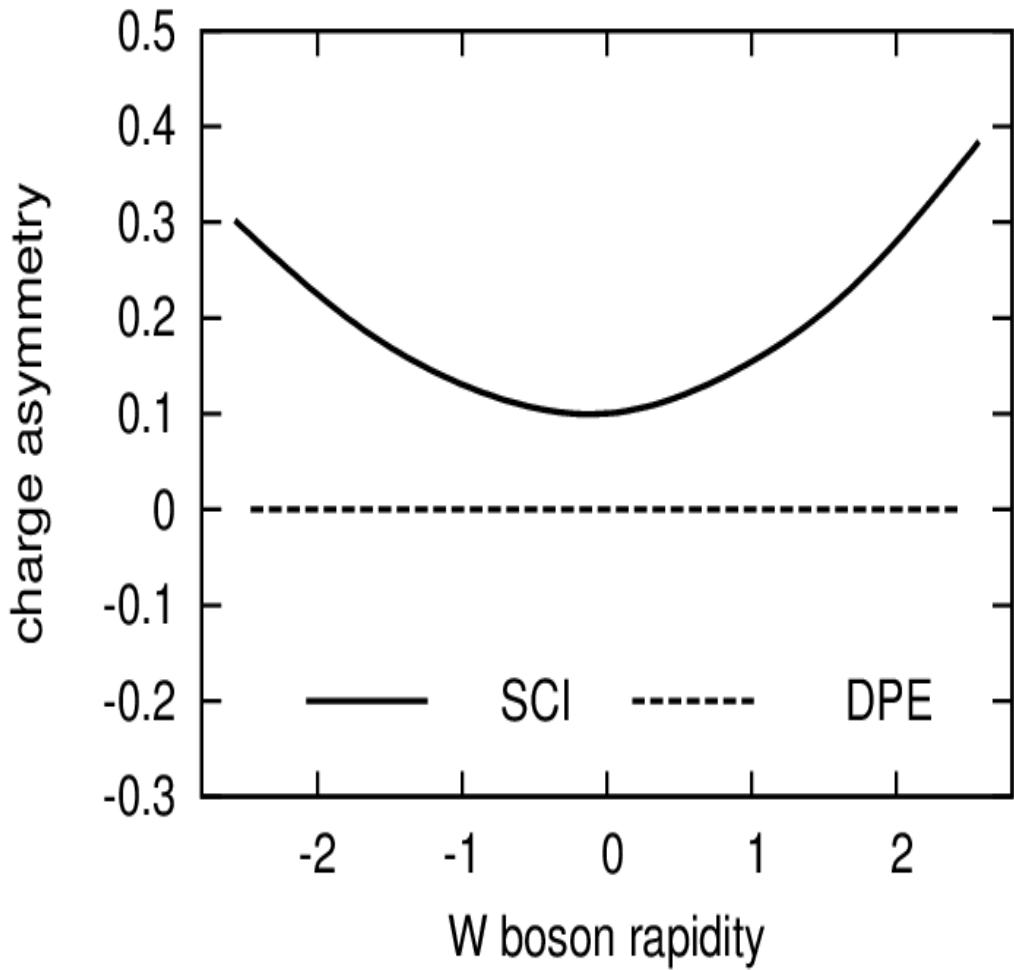
$u = u\bar{u}$, $d = d\bar{d}$ and $s = s\bar{s}$



$$A = 0$$

(even without flavour symmetry $d=u=s$)

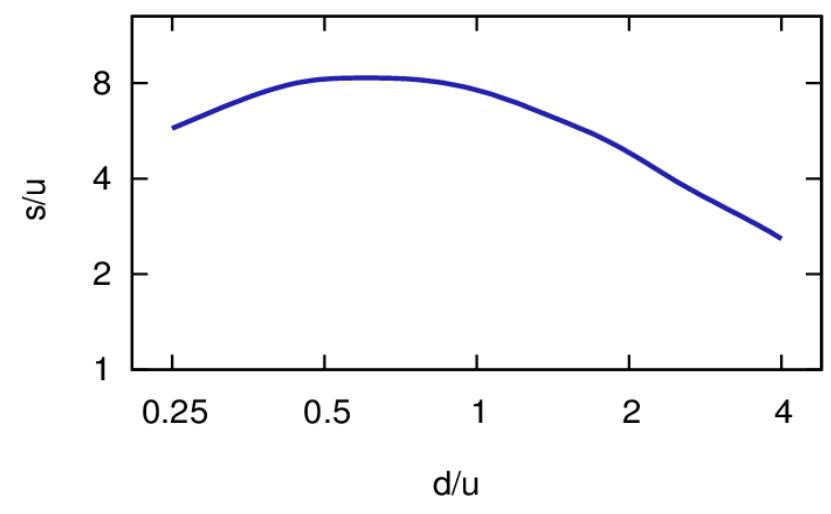
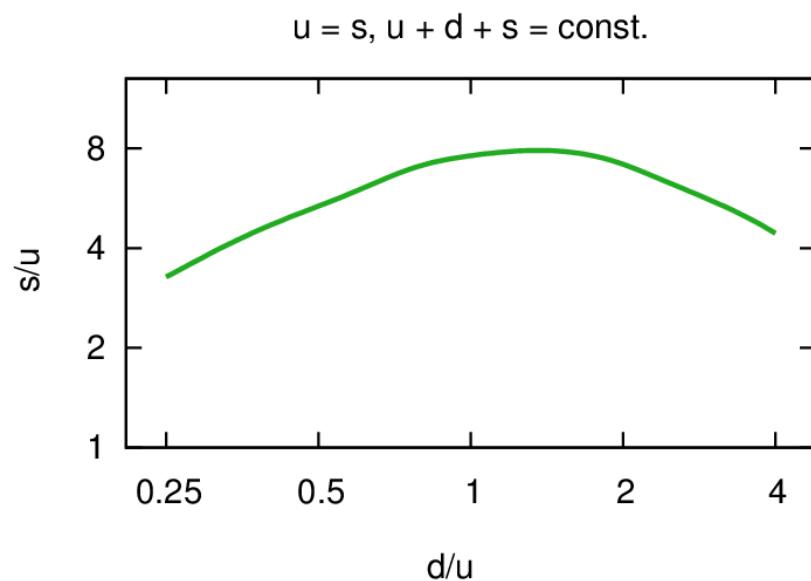
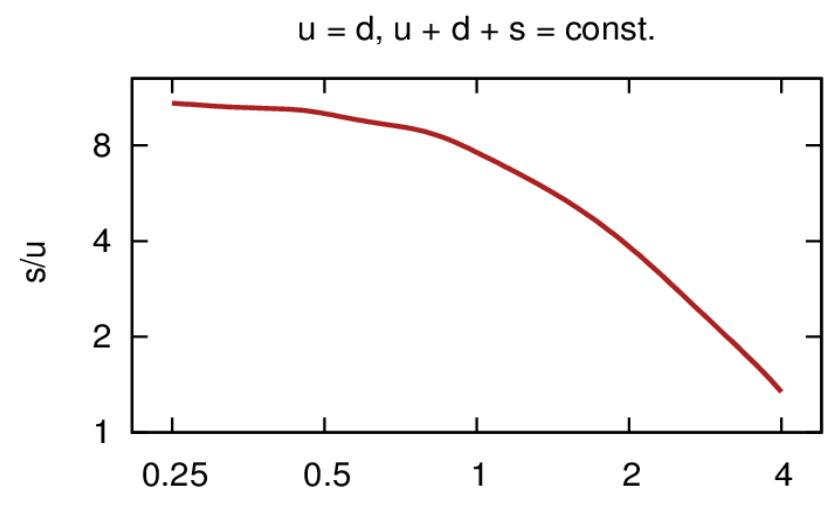
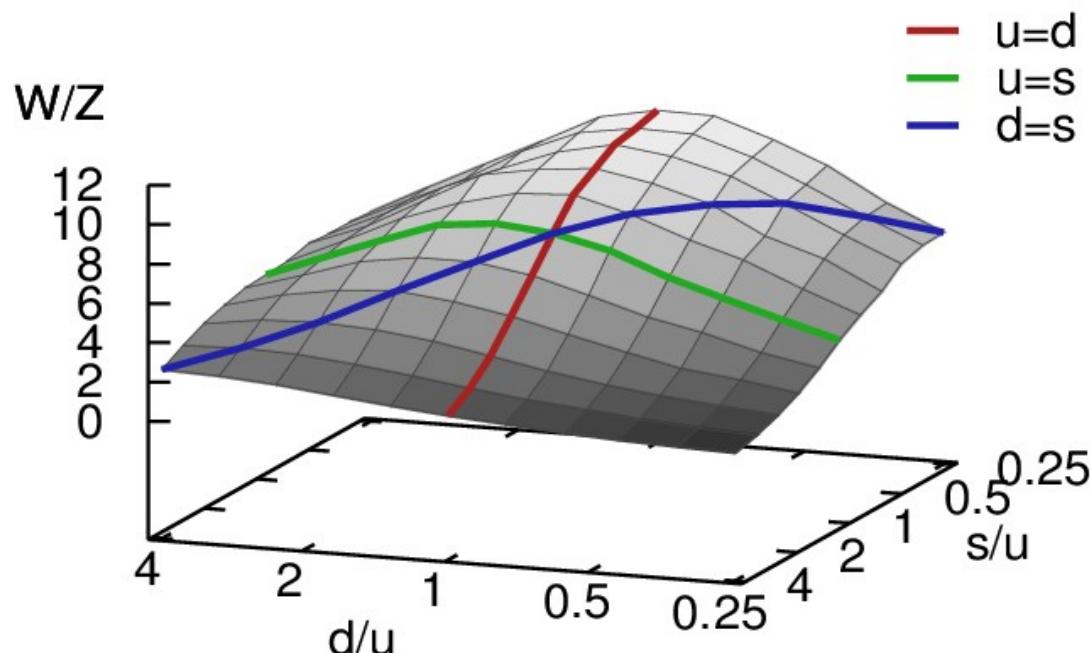
Charge asymmetry measurement



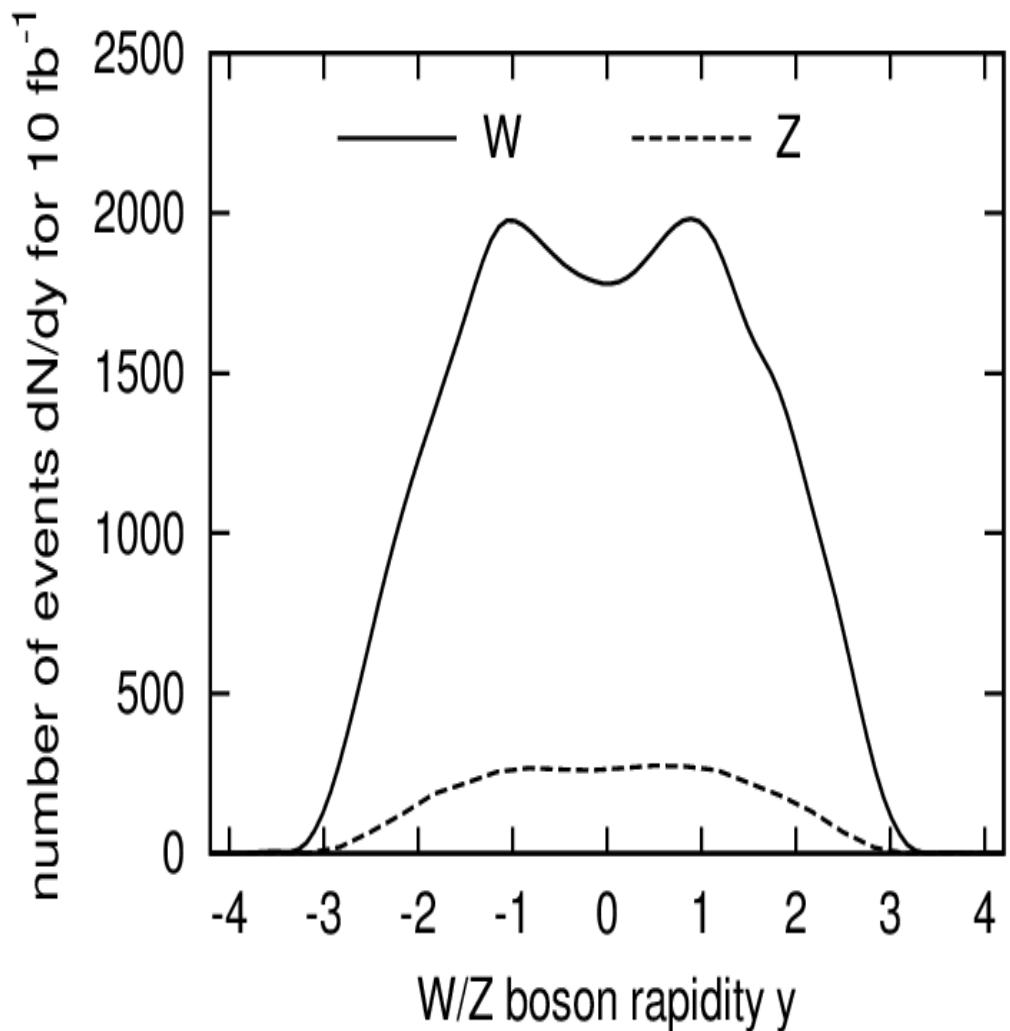
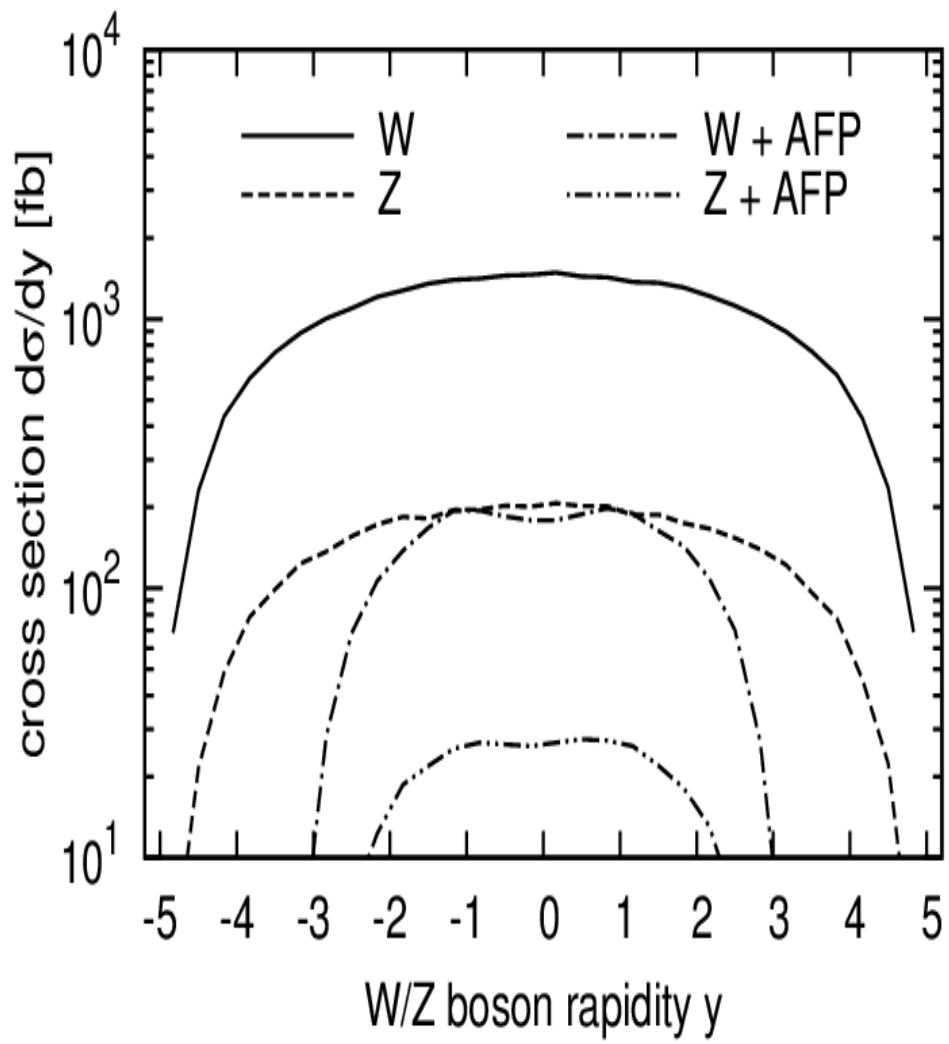
Flavour symmetry of the Pomeron

- Natural assumption for Pomeron model
 $u(x, Q^2) = d(x, Q^2) = s(x, Q^2)$
- Never tested experimentally
- HERA measurements constrain $u+d+s$
- DPE W and Z at the LHC:
 - W/Z cross section ratio is sensitive
 - Many systematic effects cancel

W/Z cross section ratio



Production cross sections



Conclusions

- W charge asymmetry – probing diffraction mechanism
- W/Z cross section ratio – probing flavour composition of the Pomeron
- Interesting and diffractive physics programme for the LHC