Diffraction (and MPI) at LHC: Where we are now …

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1) Experimental Situation

- Measured elastic / total / total inelastic cross section, plus inclusive diffractive dissociation (mainly SD, usually getting diffractive masses / ξ from correlation with gap size) and ultra-peripheral J/Ψ → basic diffractive dynamics, role of absorptive corrections, low-x saturation?...

- Some progress (CMS) on hard scattering in SD (jets, W, Z)

- In principle, already have the data to study hard SD in much more detail with gaps or with proton tags. → Short term priority

- Uunderstanding of gap based measurements is already limited by DD, ND, pile-up, so proton tagging has to be the way forward.

- Central (exclusive) production just starting … longer term future

✳ *How much of non-perturbative soft physics survives at LHC.*

how soft is diffraction? MPI in diffraction?

Half of inelastic cross section from b> 1.2 fm - where hard processes seem to be a small effect - is interaction for these b soft? Diffraction & rapidity gaps - good scanners of this region.

Hard diffraction - use of information about diffractive pdfs to test intensity of interaction - clash of small b diffractive pdfs and gap survival at large b only.

Dependence of gap survival in single diffraction on x_{Pom}, β, x of dissociating nucleon

Underlying events in hard diffraction

Rapidity gaps as a function of multiplicities in the active rapidity ranges (correlation of dN/dy in different active regions)

MPI in diffraction - how large - testing single , double Pomeron,....?

Exclusive hard central diffraction