Forward–Central Jet Correlations

Pedro Cipriano

FESB, Split, Croatia

pedro.cipriano@cern.ch

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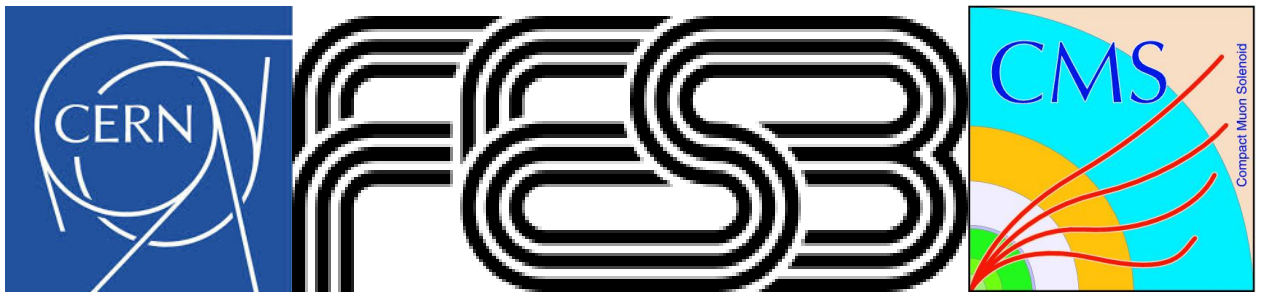
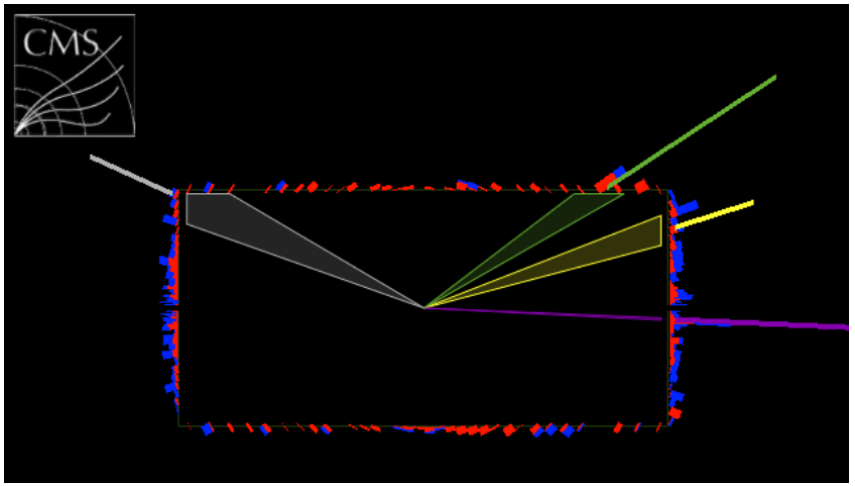
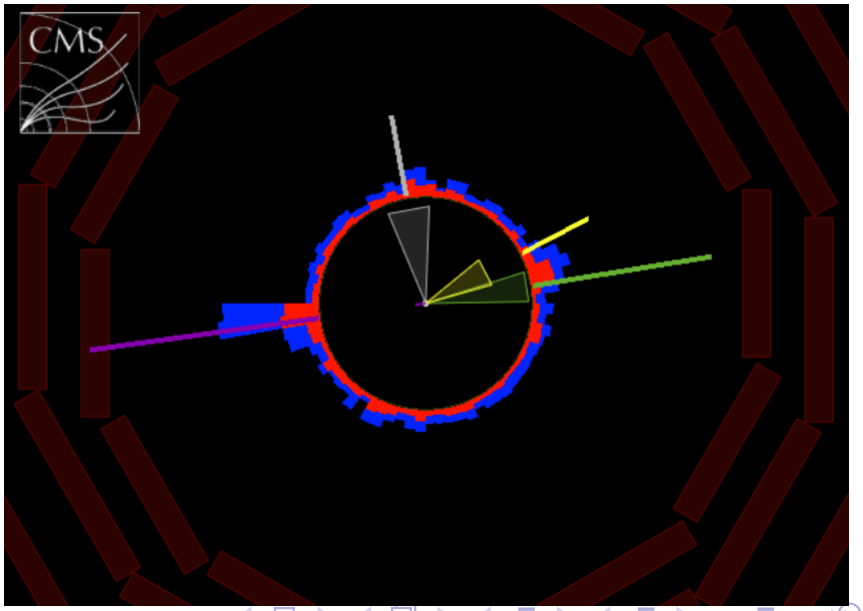
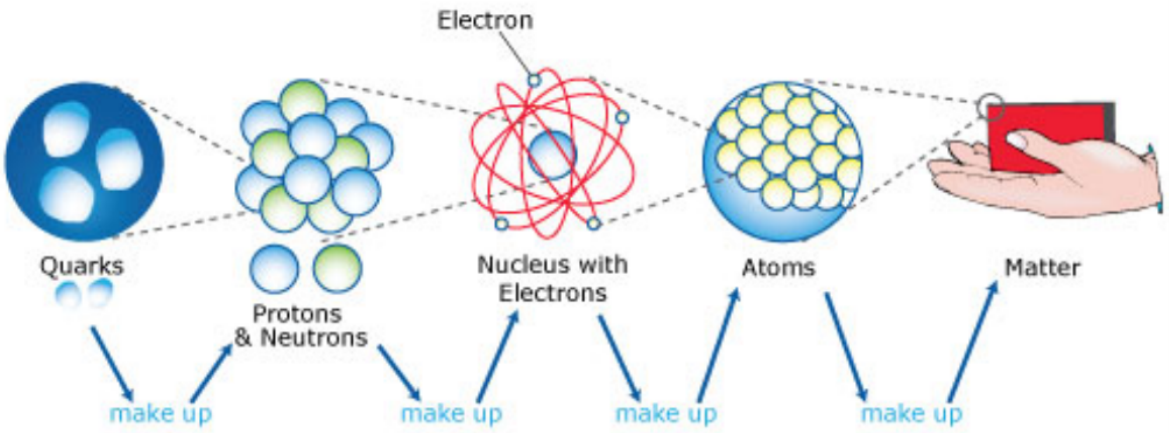


Overview





Proton Structure



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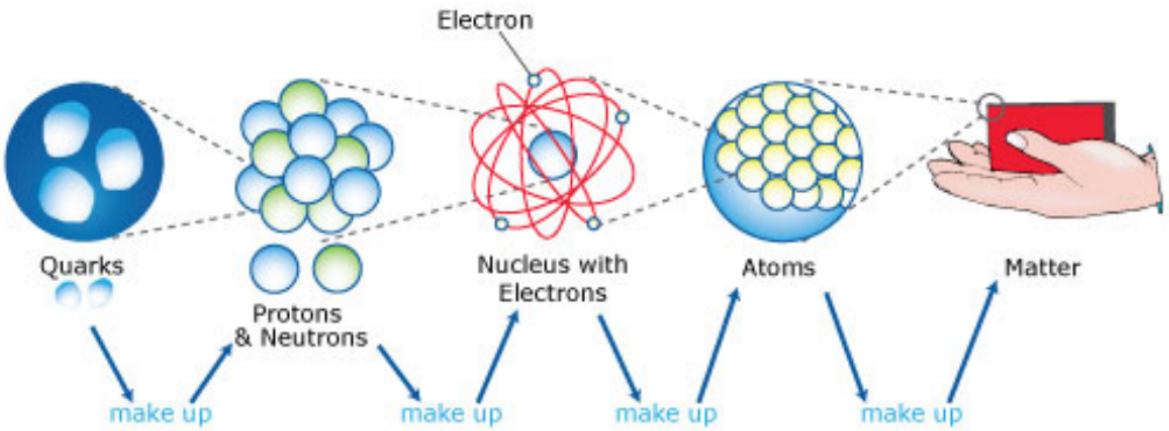
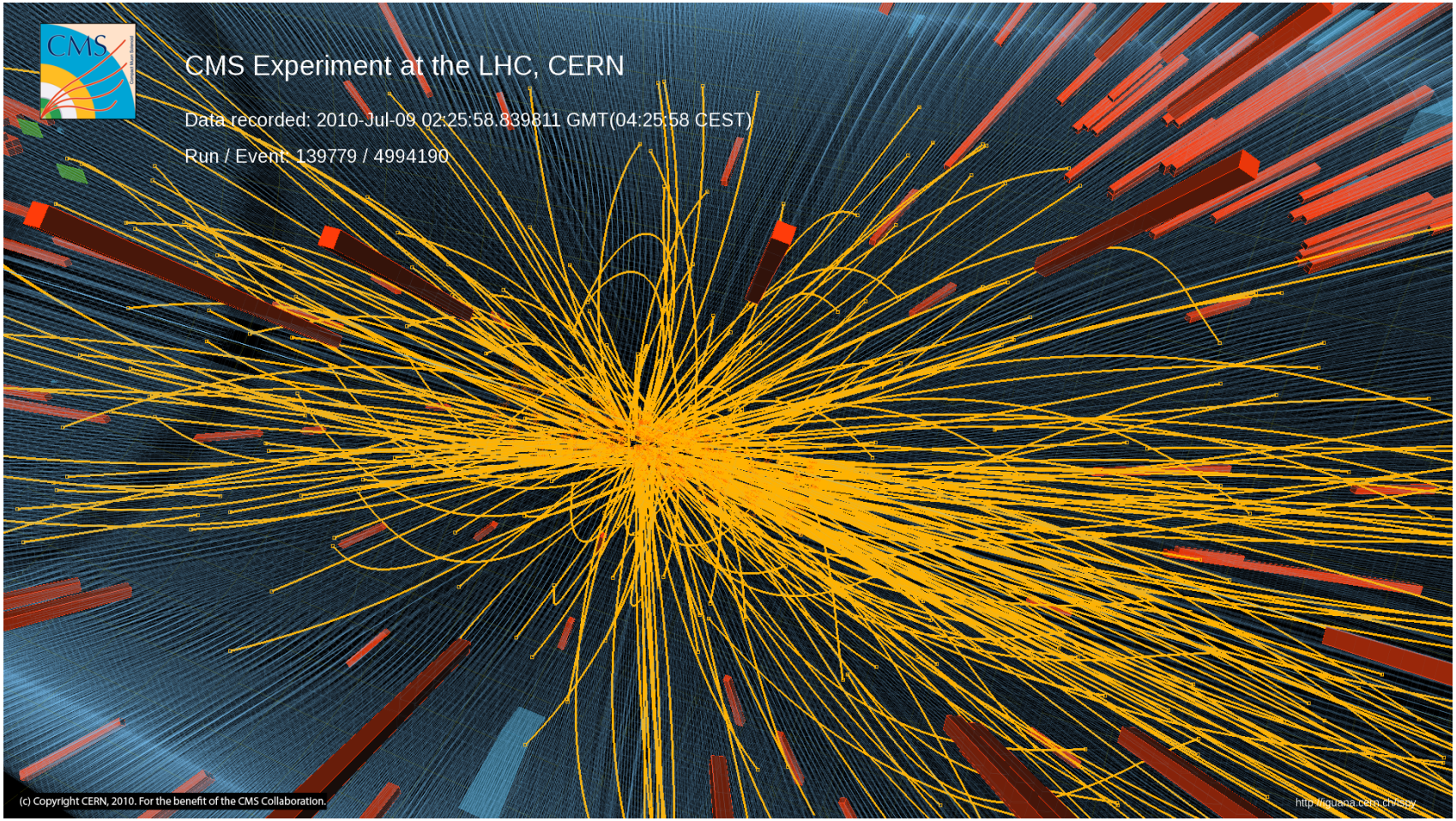


- Protons have two types of quarks: valence quarks and sea quarks.
- Valence quarks contribute to the quantum number of the hadron.
- Sea quarks are virtual quark-antiquark pairs which come from the splinting gluons within the hadron.
- Systematic description of QCD stills a challenge.
- Understanding the structure of the proton will give a new insight on these riddles.

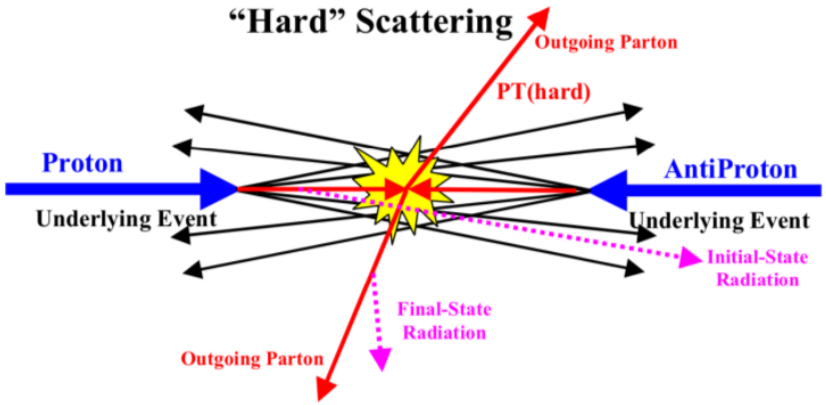
Proton Collisions



Proton Collisions

What happens in a proton collision?

- Initial State Radiation
- Final State Radiation
- Beam–Beam Remnants
- Pile–up



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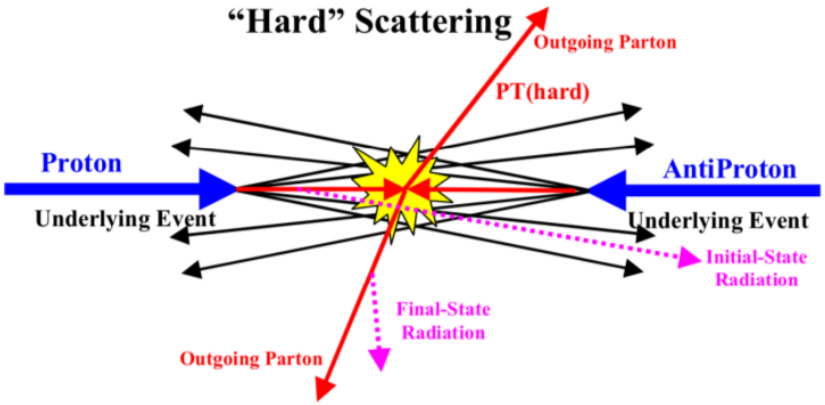
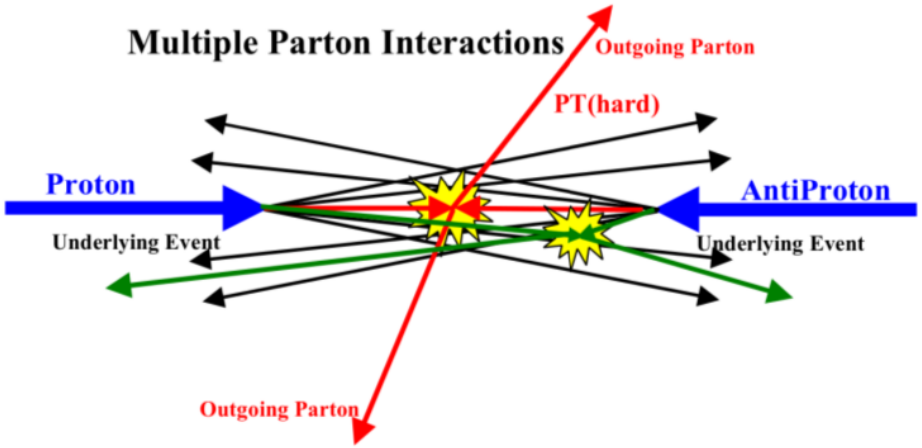


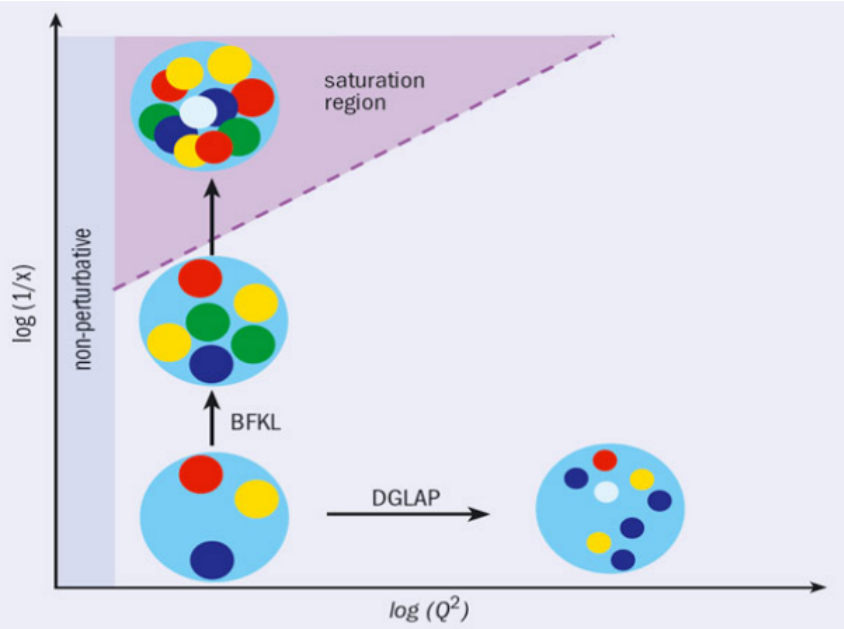


Multi-Parton Interations

- In the same proton there are several partons.
- It is possible that more then one of them collide.

Evolution Equations

One way to study the proton structure is through the evolution of the parton radiation on a proton collision.



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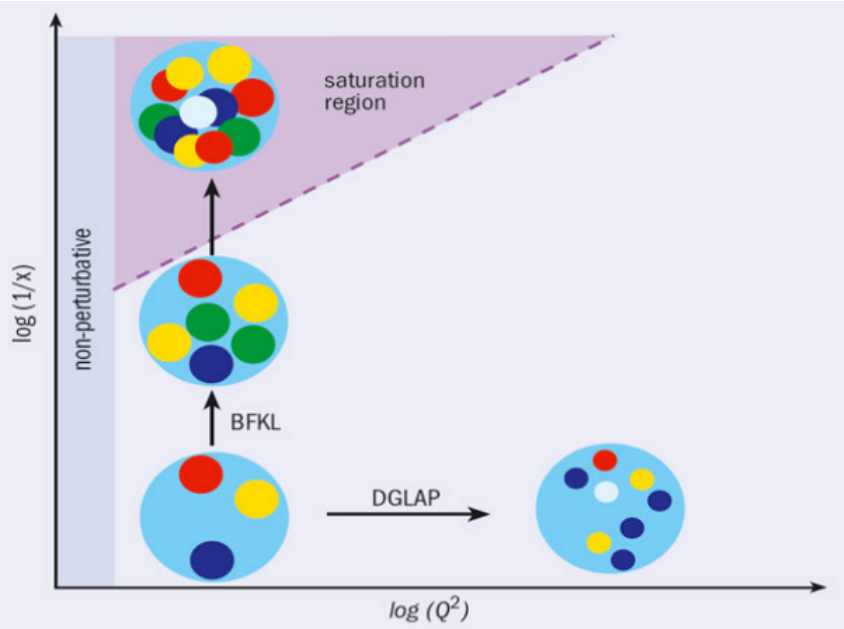

DGLAP (Dokshitzer-Gribov-Lipatov-Altarelli-Parisi)

- Starts from an initial distribution at a predefined scale
- Strongly ordered in k_T
- Weakly ordered in x

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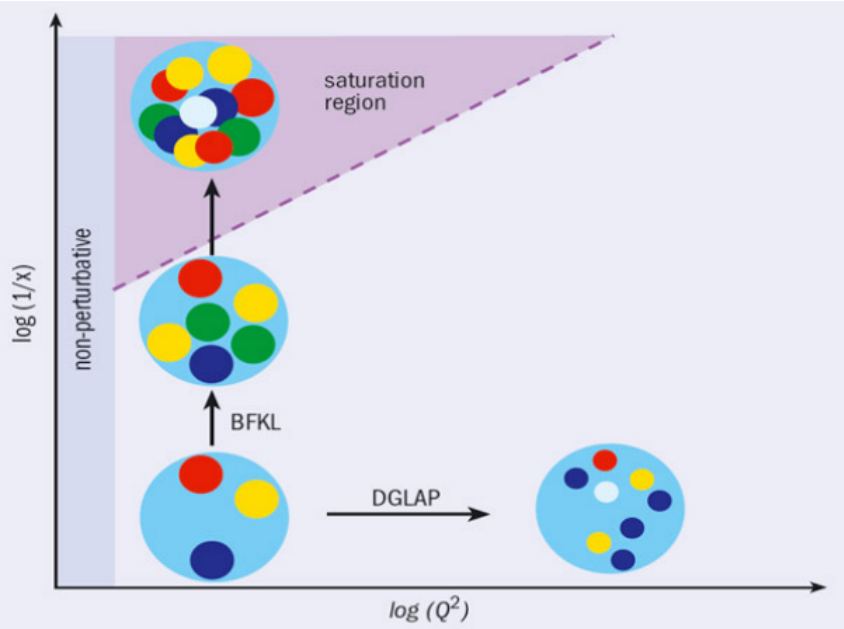

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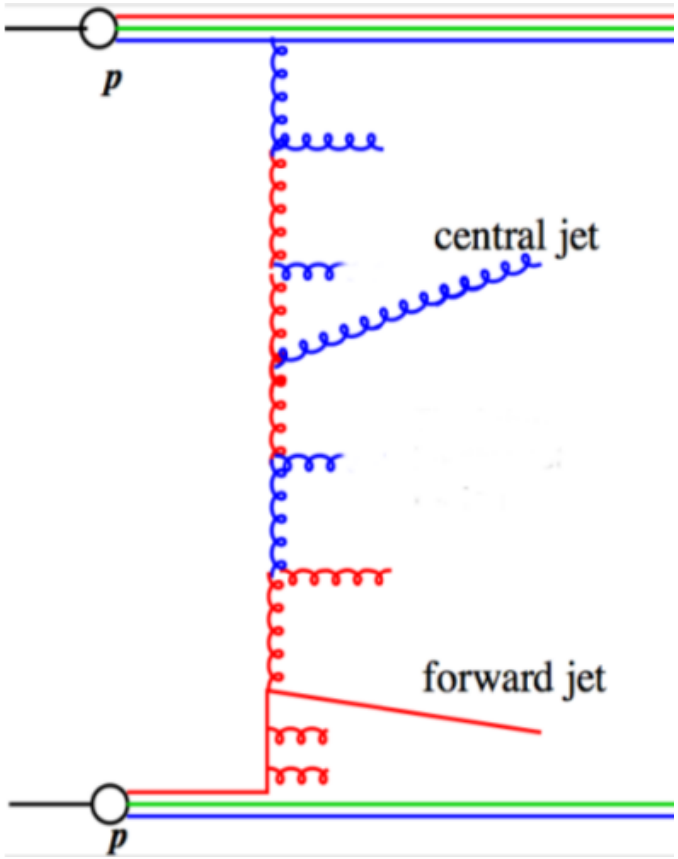
BFKL (Balitsky-Faden-Kuraev-Lipatov)

- Resum the $\log(1-x)$ contributions
- Expected to be the dominant scheme at low-x
- Cascade strong ordered in x but not in k_T

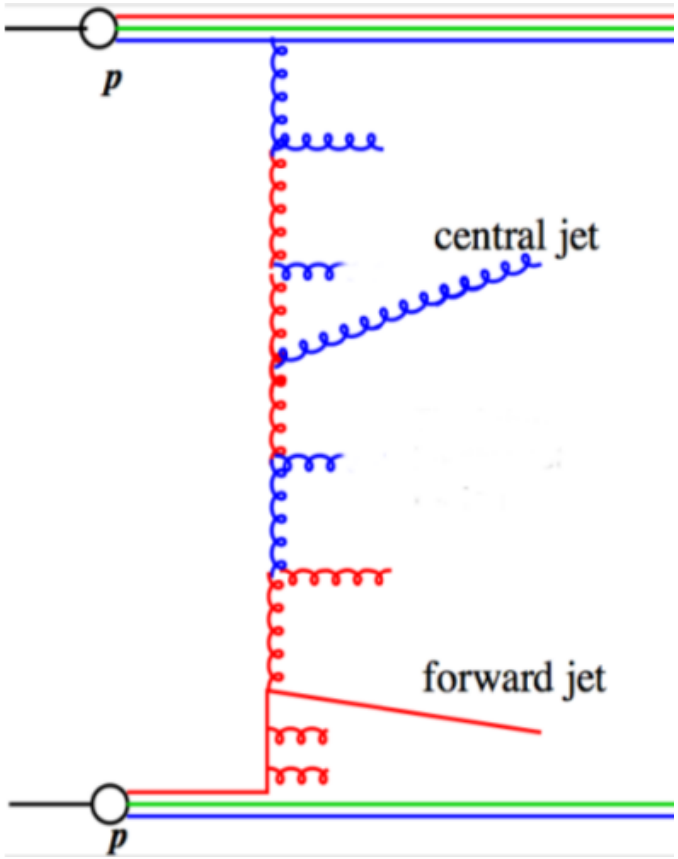
Azimuthal Correlations



Forward–Central Jet Correlations

- Probe simultaneously the high and low–x regions / quark and gluon–ladders

Azimuthal Correlations



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Large η difference between jets

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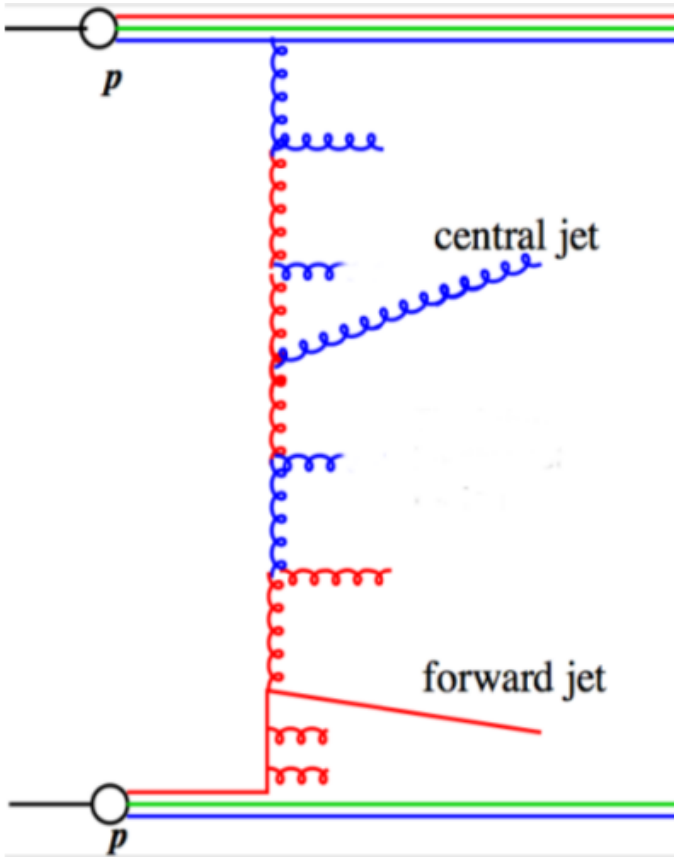

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Azimuthal correlations ($\Delta\phi$)

- DGLAP: stronger correlations
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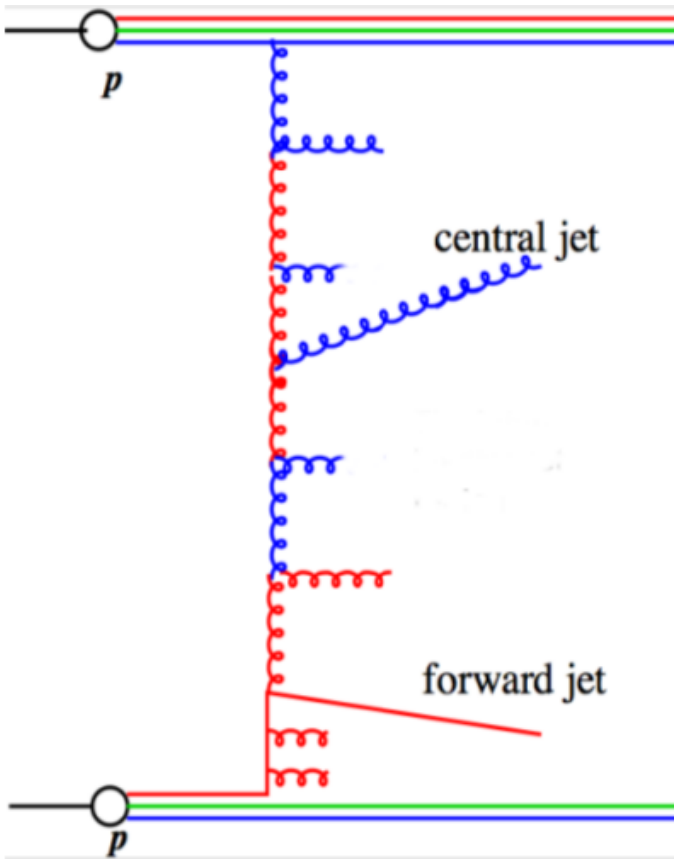

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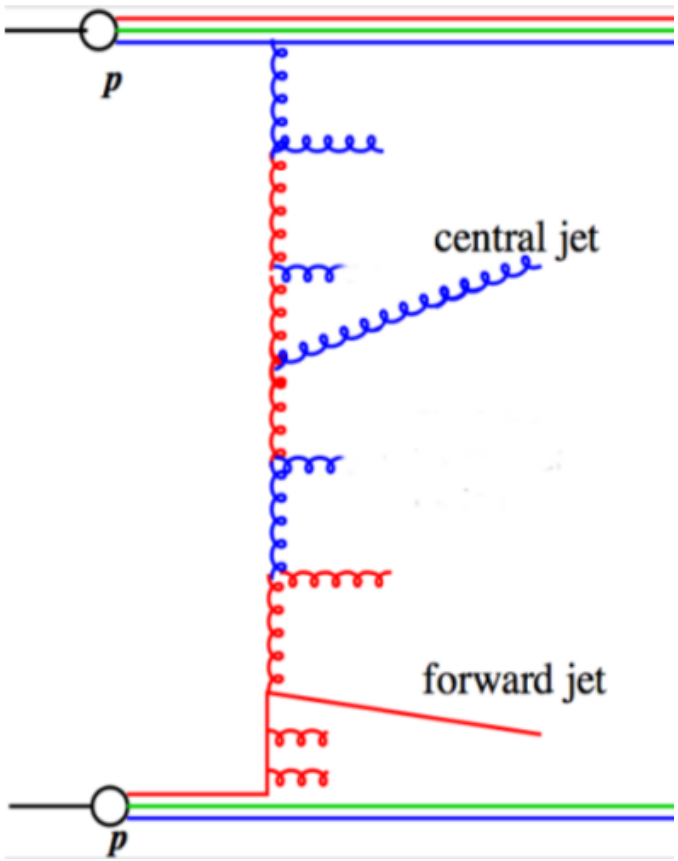
Azimuthal Correlations



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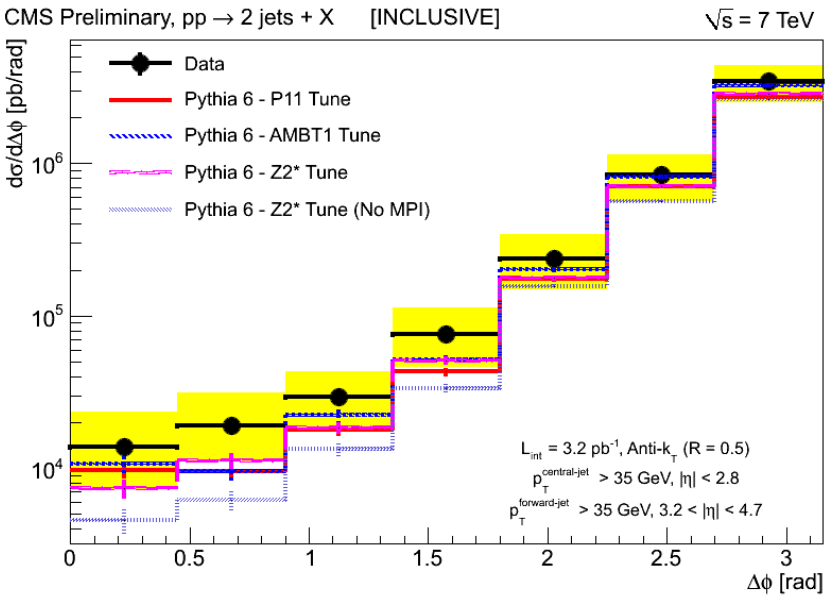
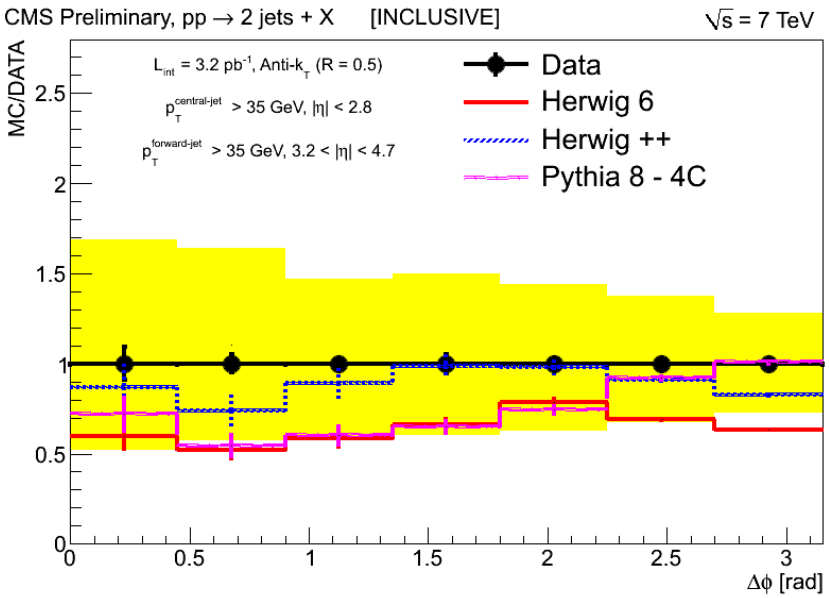
The study of an extra jet inside or outside helps to understand the parton ladder
Sensitivity to underlying event and multi–parton interactions

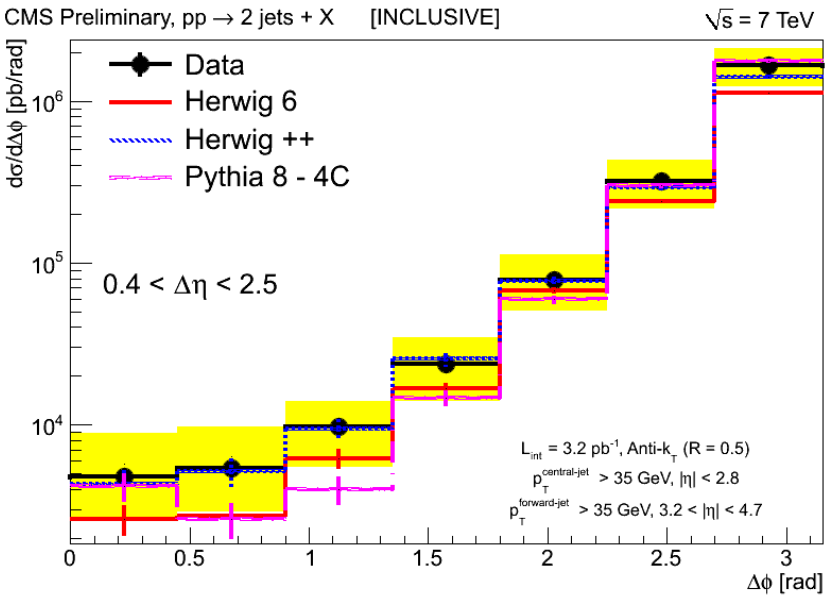
Inclusive Scenario

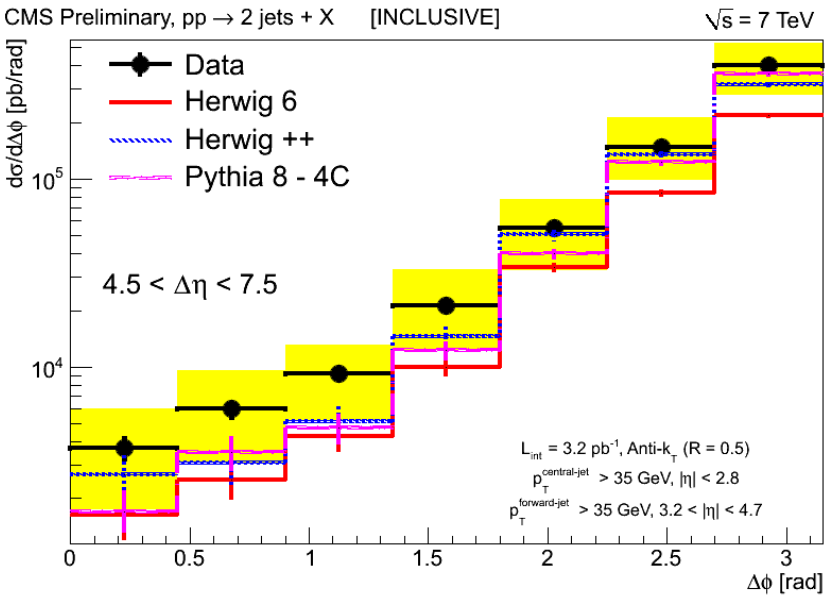




- $\Delta\phi$ is a steeply falling distribution
- All the Mc describe the distribution reasonably well, except for the lower $\Delta\phi$ region

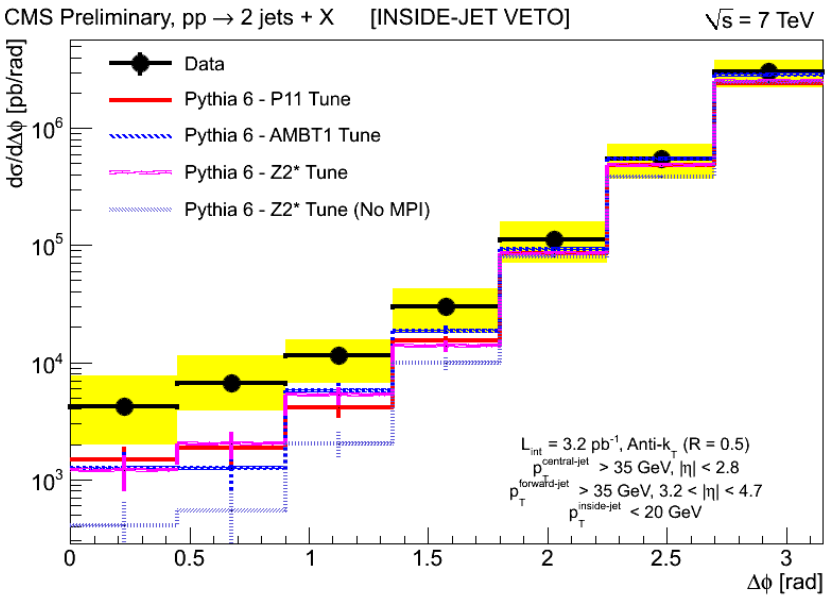
Inclusive Scenario Diferentially

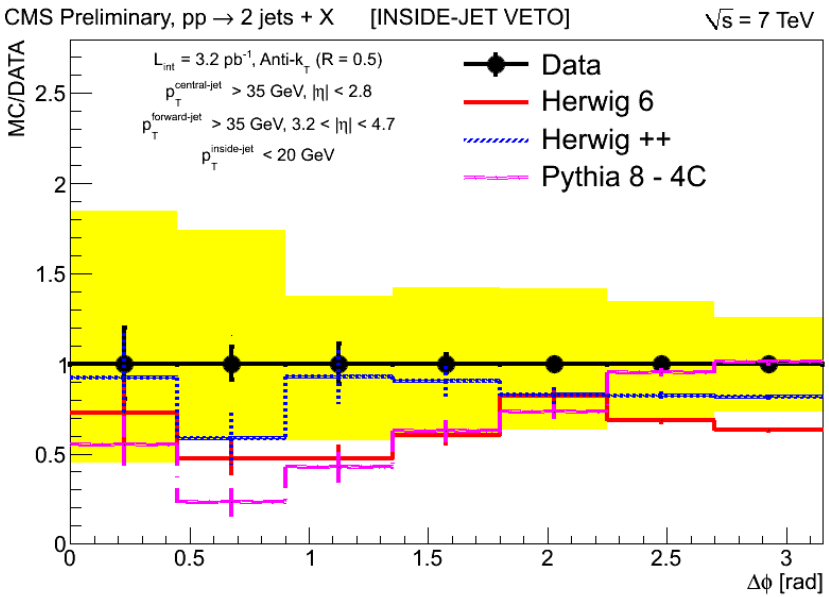




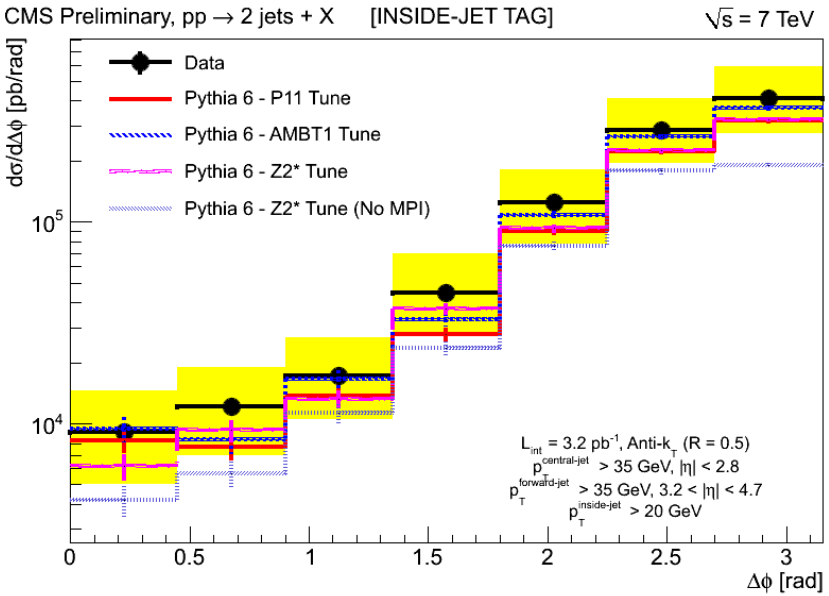
- The slope flattens out as the rapidity gap increases.
- The MC predictions have more troubles to reproduce the results in the wider rapidity gap.

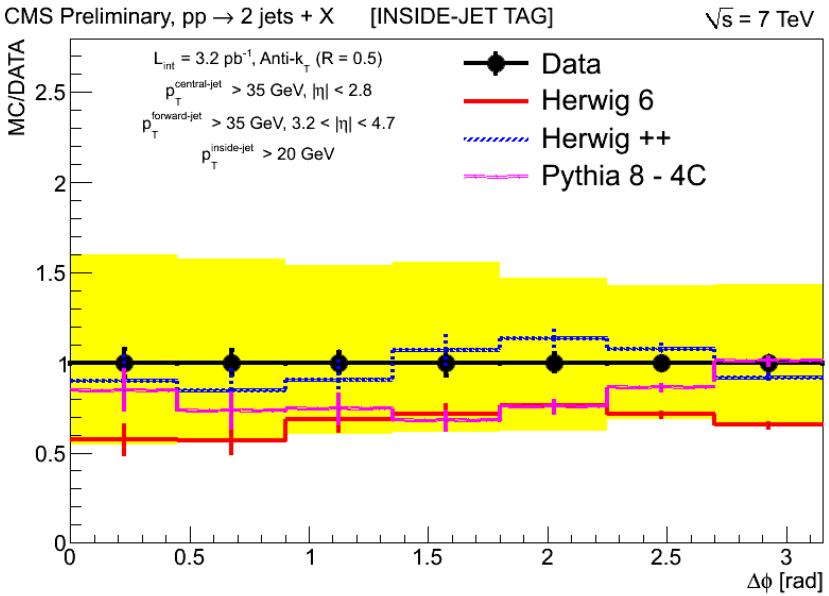
Veto Scenario



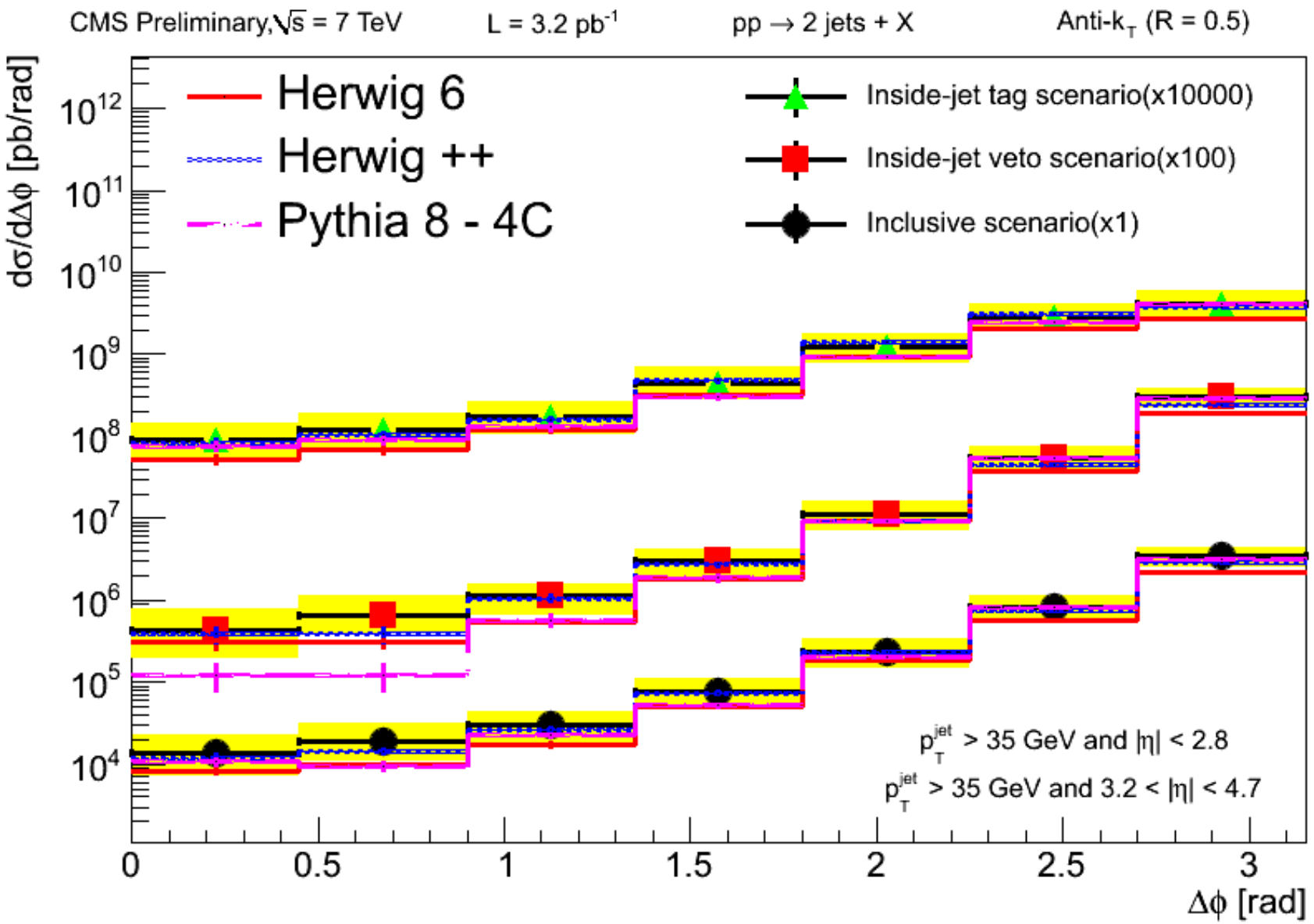


- The correlation is stronger than in the inclusive scenario
- Pythia deviates more from data while Herwig describes it better for lower $\Delta\phi$





- The decorrelation is stronger than in the inclusive scenario
- Most predictions seem to yield a reasanoble shape but fail slightly in the normalization


CMS Preliminary, $\sqrt{s}$ = 7 TeV
L = 3.2 pb^{-1}
pp → 2 jets + X
Anti-k$_T$ (R = 0.5)
Herwig 6
Herwig ++
Pythia 8 - 4C
Inside-jet tag scenario(x10000)
Inside-jet veto scenario(x100)
Inclusive scenario(x1)
$d\sigma/d\Delta\phi$ [pb/rad]
p_T^{jet} > 35 GeV and |η| < 2.8
p_T^{jet} > 35 GeV and 3.2 < |η| < 4.7
Δφ [rad]

Summary

- Forward–Central Jet Correlations had been measured, probing the high and low–x physics.
- DGLAP MCs describe the observables very well.
- No Monte Carlo is able to describe all features of the data.

Thank you for your attention