Azimuthal correlation in multijet events at 13 TeV

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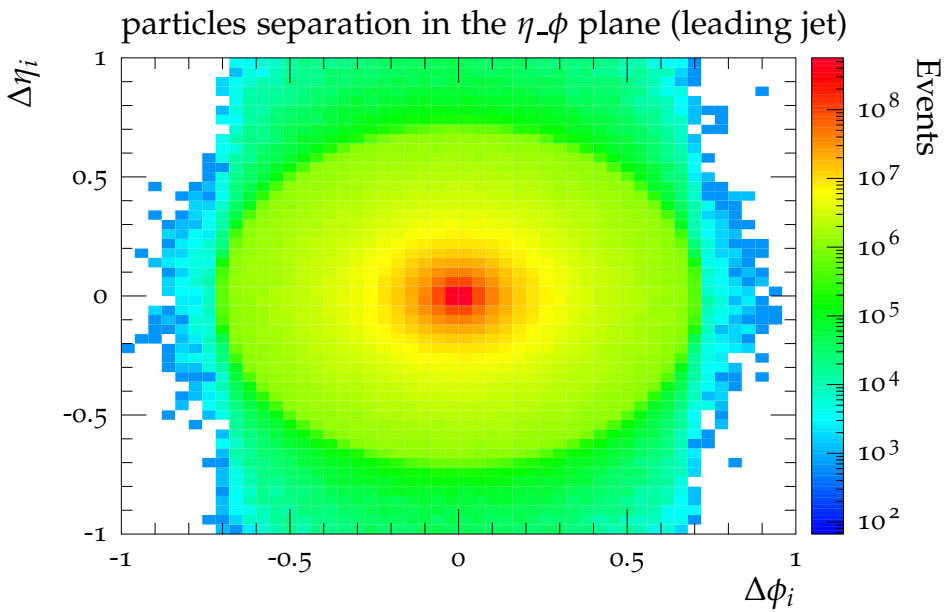
Outline

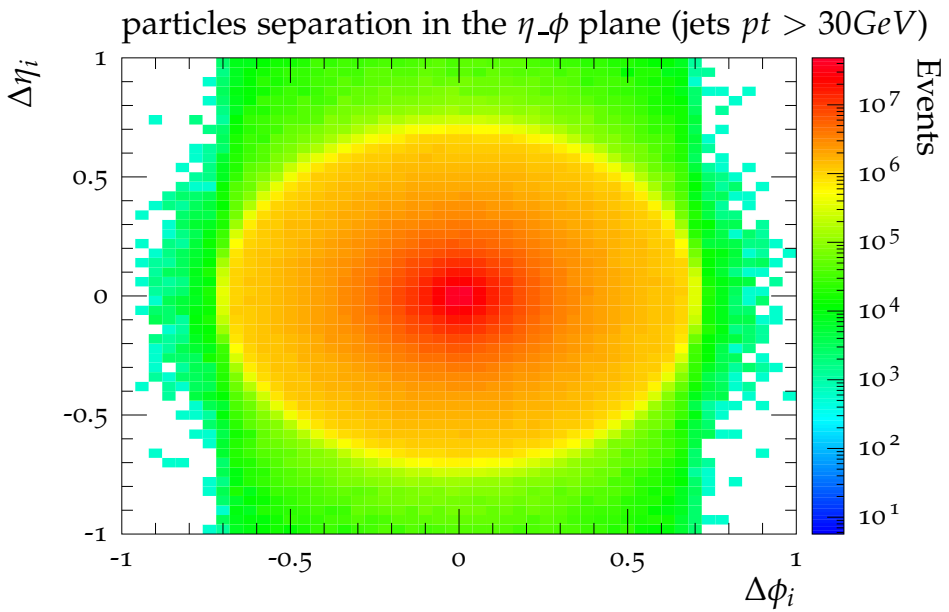
Motivation

- Studying corners of phase space in order to:
  - Accessing the Sudakov region.
  - Testing resummation (PS).
  - Factorization breaking sensitivity?

- Main focus on:
  - High p_t jets scenarios ($> 1 TeV$)
    - $\Delta\phi$ of the leading system.
    - p_t imbalance (p_t^{imb})
- For this we used the predictions from fixed order NLO ($2 \rightarrow 2$ and $2 \rightarrow 3$), modified fixed order NLO (POWHEG), POWHEG+PS, P8.

Jets size



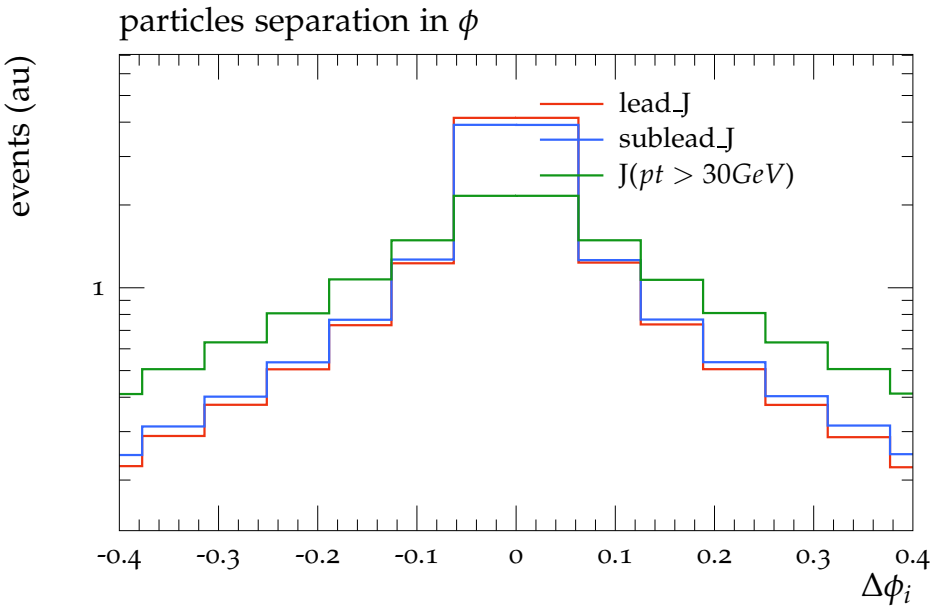


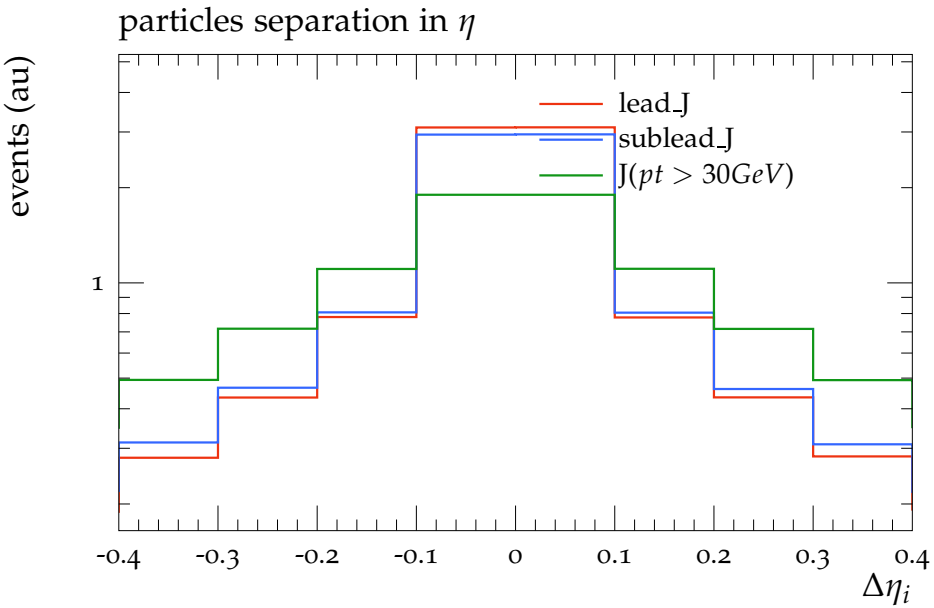
p_t of the leading jets $> 3TeV$.

- Pen-like leading jets structure (effective $\Delta R \sim 0.2$).
- ΔR of extra ($p_t > 30GeV$) jets ~ 0.7

Jets size

η and ϕ jets size projections

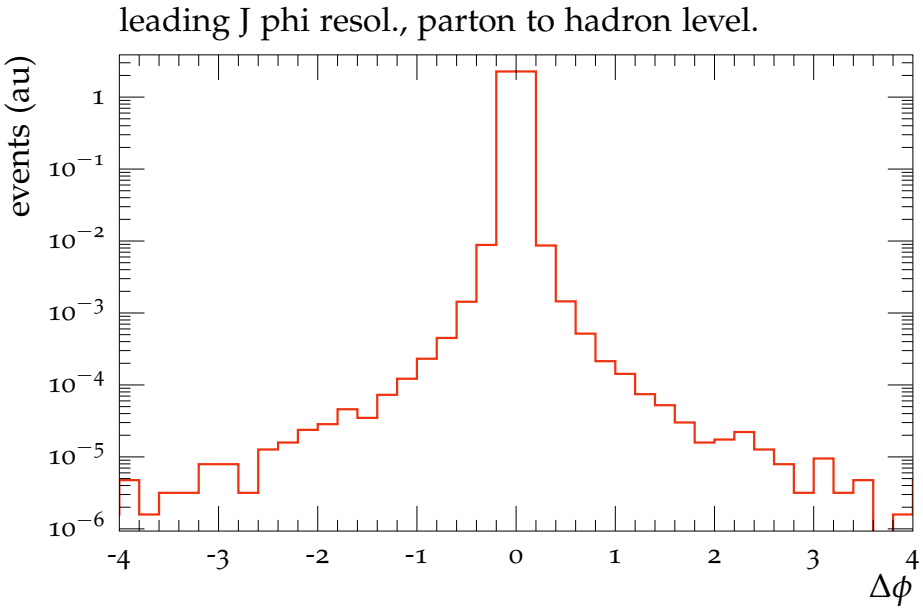


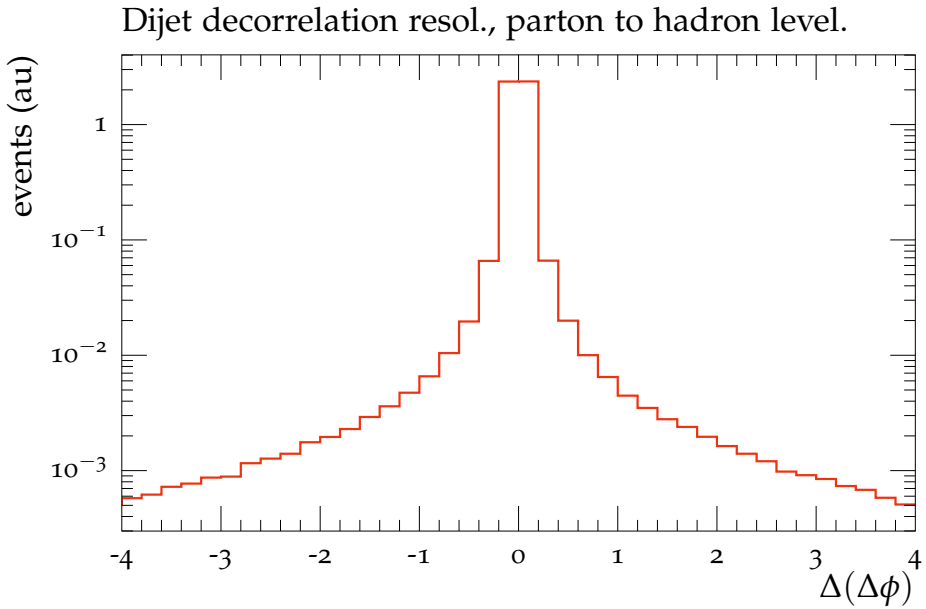


p_t of the leading jets $> 3\,TeV$.

Resolution

Non-perturbative uncertainties important when dealing with small ϕ differences



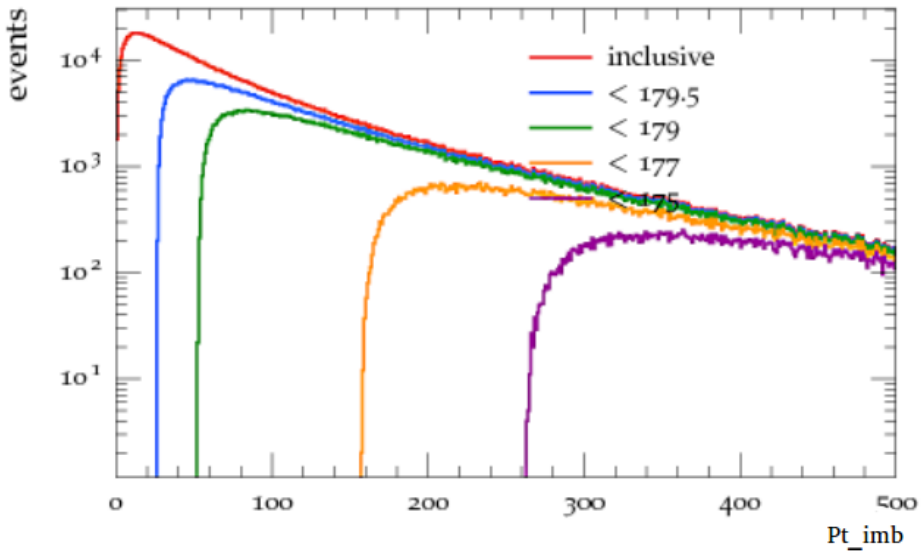


x-axes in (°).

- Uncertainty in going from parton to hadron level $\sim 0.1°$

p_t imbalance

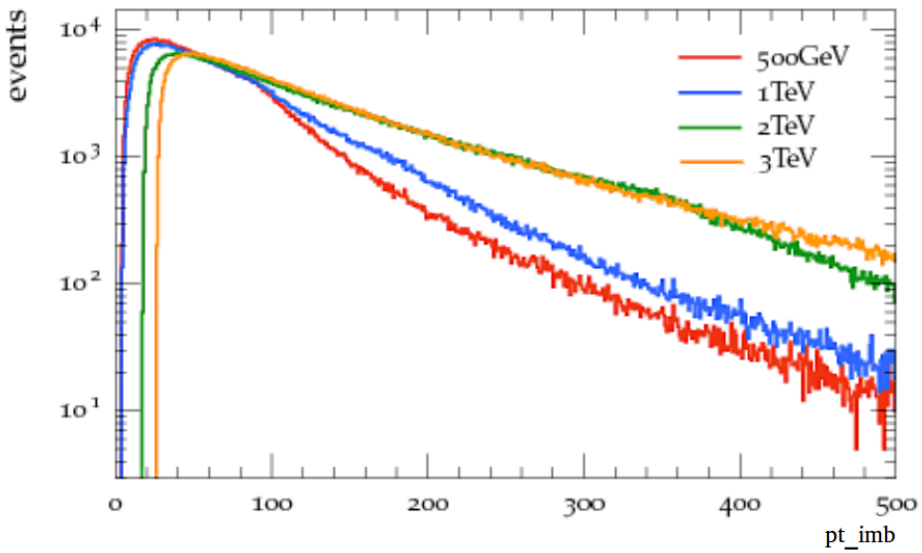
p_t imbalance for different separations in $\Delta\phi$



- at least 30GeV for half a degree
- at least 50GeV for one degree
- at least 160GeV for three degrees

p_t imbalance

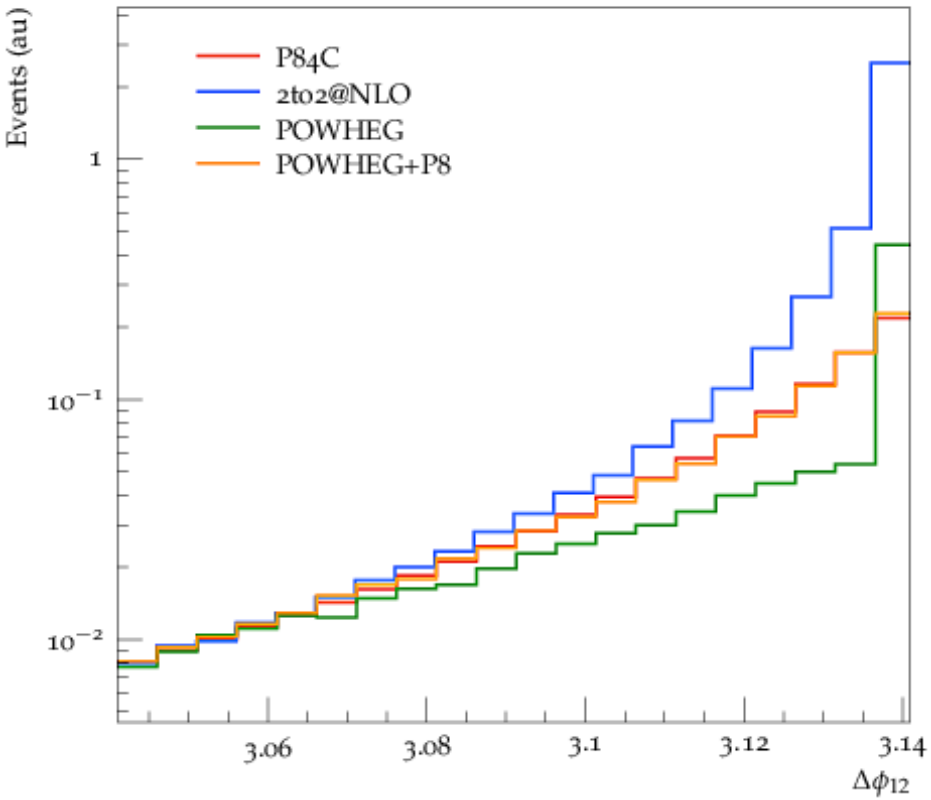
p_t imbalance for different leading jets p_t thresholds and requiring at least $\Delta\phi = 0.5^\circ$ away from π)



- at least $\sim 40 GeV$ of p_T^{imb} for being at least 0.5° away from π
- requiring a small decorrelation between the high p_T jets implies a sizeable amount of p_T^{imb}

$\Delta\phi$

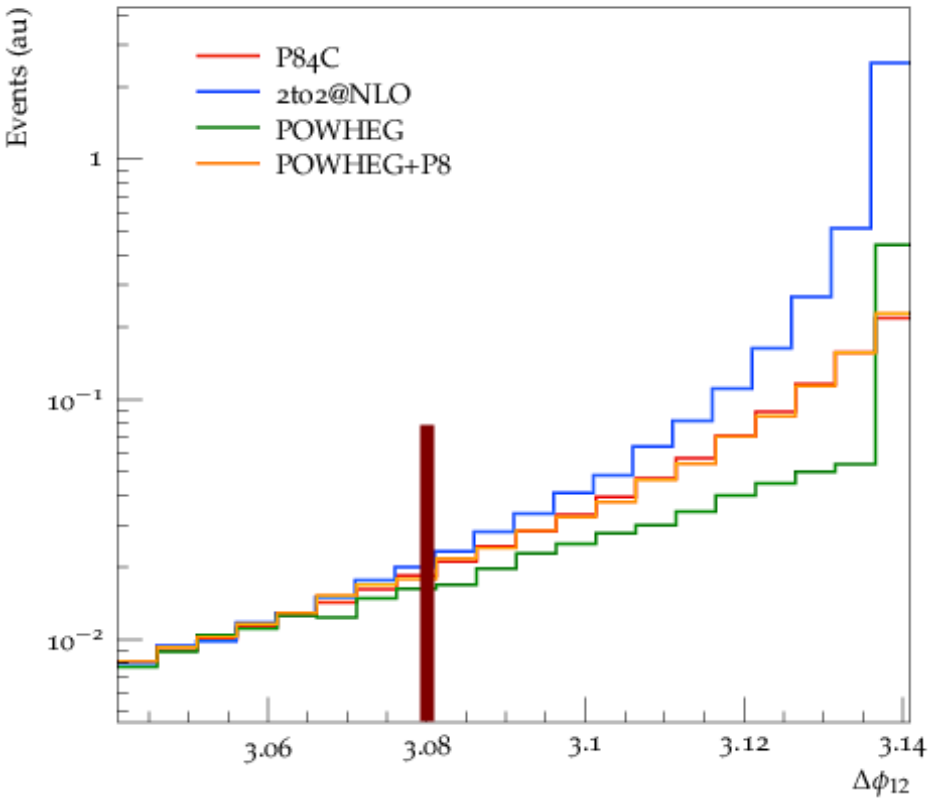
$\Delta\phi$ between the leading jets ($p_t > 2TeV$)



- divergent NLO
- Sudakov tamed POWHEG
- Resummation from PS

$\Delta\phi$

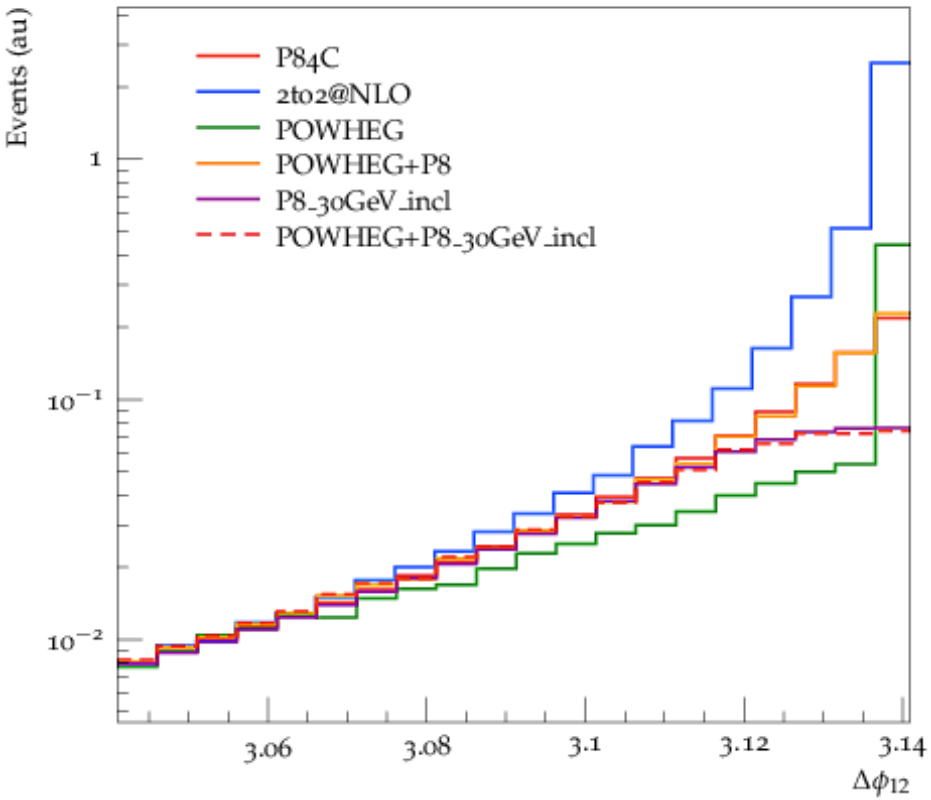
$\Delta\phi$ between the leading jets ($p_t > 2TeV$)



- divergent NLO
- Sudakov tamed POWHEG
- Resummation from PS
- Resummed contributions start at $\Delta\phi \sim 3.085(176°)$

$\Delta\phi$

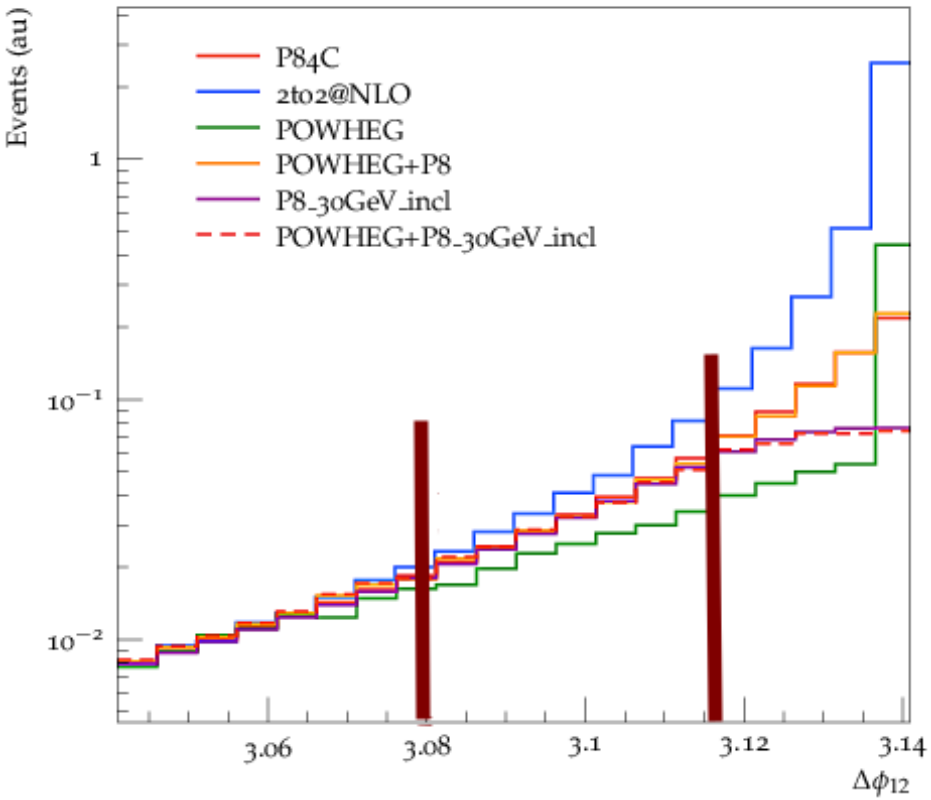
$\Delta\phi$ between the leading jets ($p_t > 2\,TeV$)



- Compare with the $\Delta\phi$ dist. requiring at least one extra jet ($p_t > 30\,GeV$)

$\Delta\phi$

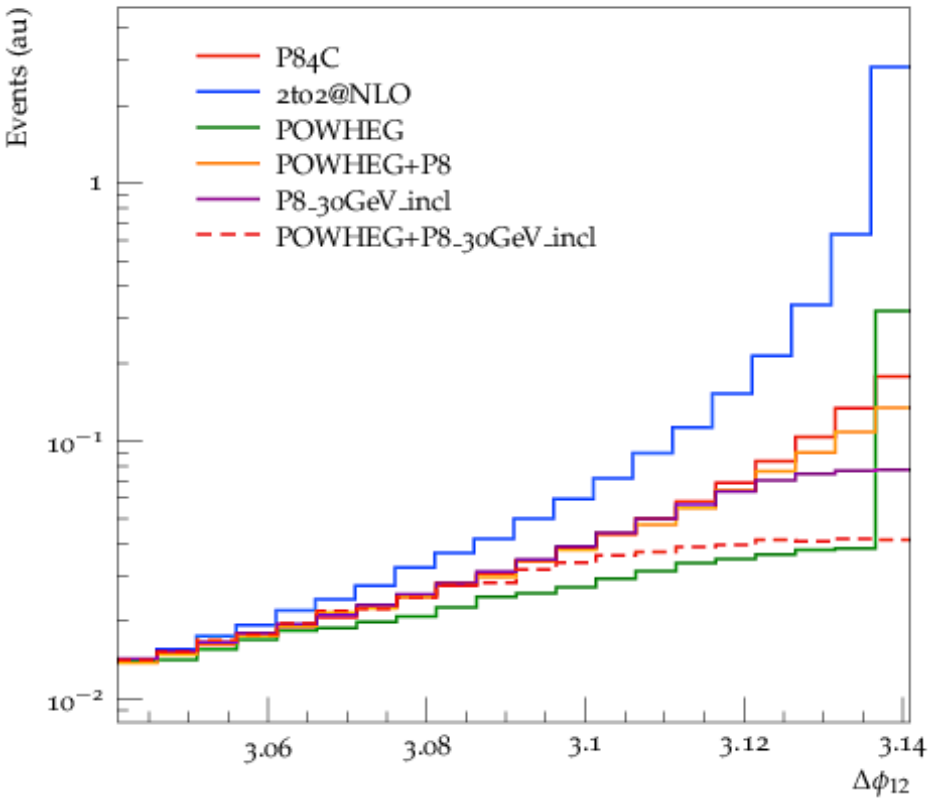
$\Delta\phi$ between the leading jets ($p_t > 2\,TeV$)



- Compare with the $\Delta\phi$ dist. requiring at least one extra jet ($p_t > 30\,GeV$)
- A piece of the Sudakov region is sensible to contributions of partons with $p_t \sim 30\,GeV$.

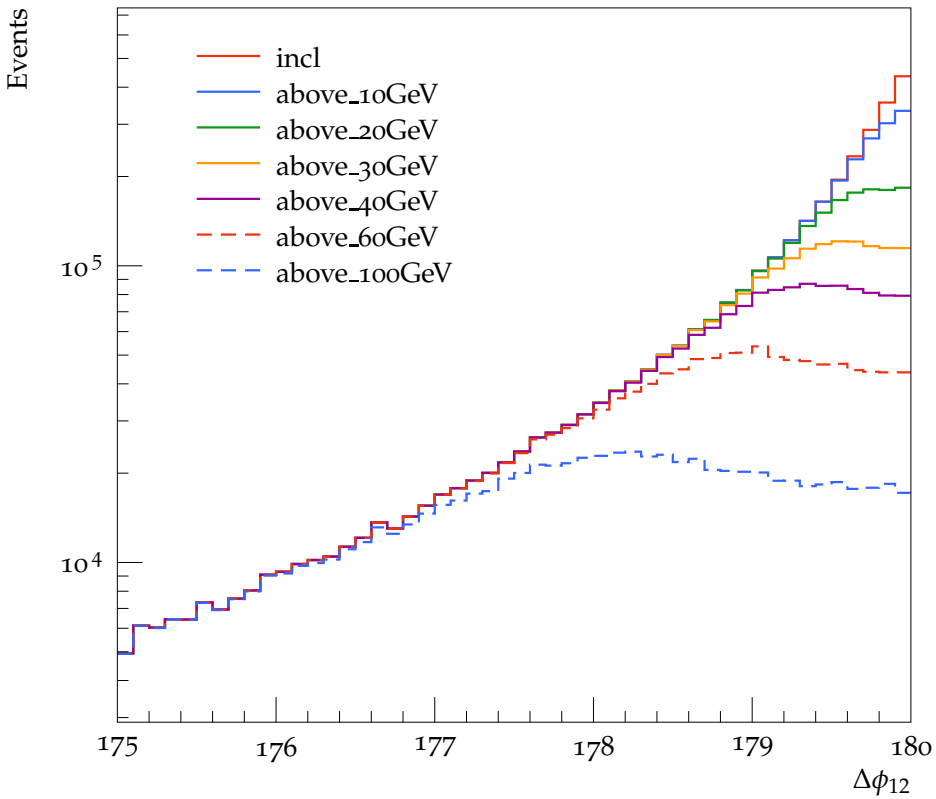
$\Delta\phi$

$\Delta\phi$ between the leading jets ($p_t > 1\,TeV$)



- 1TeV case even more interesting
- POWHEG modified Sudakov for matching to PS affects considerably the resummation region (even the one we could access).

$\Delta\phi$ between the leading jets ($p_t > 3\,TeV$)



- Evolution of the non-resolvable region as a function of p_t threshold of the extra jets.
- extra jets with $p_t > 100\,GeV$ produce angular decorrelations of less than 3° from π

Summary

- High p_T jets are very narrowed leading to a small uncertainty which could come from non-perturbative physics and allowing a possible well precise future measurement.
- Possible scenarios for studying the multiple soft gluon emission and resummation were studied using the $\Delta\phi$ and p_T^{imb} of the leading jets.
- For relatively high p_T radiated partons, $\Delta\phi$ between the leading jets takes very small values (within the resummation region).
- Analogously, requiring a small decorrelation between the high p_T jets implies a sizeable amount of p_T^{imb}.

Thank you for your attention.