Computation of QCD cross sections of large multiplicity final states at NLO

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  - theoretical basis is known and robust
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- Latter
  - is good for making improvements
  - could lead to unnecessary repetitions (waste)

Workshops could be useful to reduce waste

(at the end efficient and correct codes are needed)

Cross sections at NLO

$$\sigma = \sigma^{\mathrm{LO}} + \sigma^{\mathrm{NLO}} + \ldots$$

Born:

$$\sigma^{\mathrm{LO}} = \int_m \mathrm{d}\sigma_m^{\mathrm{B}} = \int \mathrm{d}\Phi_m \left| M_m^{(0)} \right|^2 J_m$$

NLO:

$$\sigma^{\mathrm{NLO}} = \int_m \mathrm{d}\sigma_m^{\mathrm{V}} + \int_{m+1} \mathrm{d}\sigma_{m+1}^{\mathrm{R}}$$

$$= \int \mathrm{d}\Phi_m \, 2\,\mathrm{Re}\left(M_m^{(0)*} M_m^{(0)} \right) J_m + \int \mathrm{d}\Phi_{m+1} \left| M_{m+1}^{(0)} \right|^2 J_{m+1}$$

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- Most important messages for tree level:
  - solutions to efficient PS generation (PHEGAS, MADEVENT)
  - recursive aproach to amplitudes: BG is most efficient for large *m*
  - MC summation over helicity is useful
  - MC summation over colour is the 'only practical' way for 'colourful' processes

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- Essentially
  - same for cut-constructible (C) parts
  - different in computing the rational (R) parts

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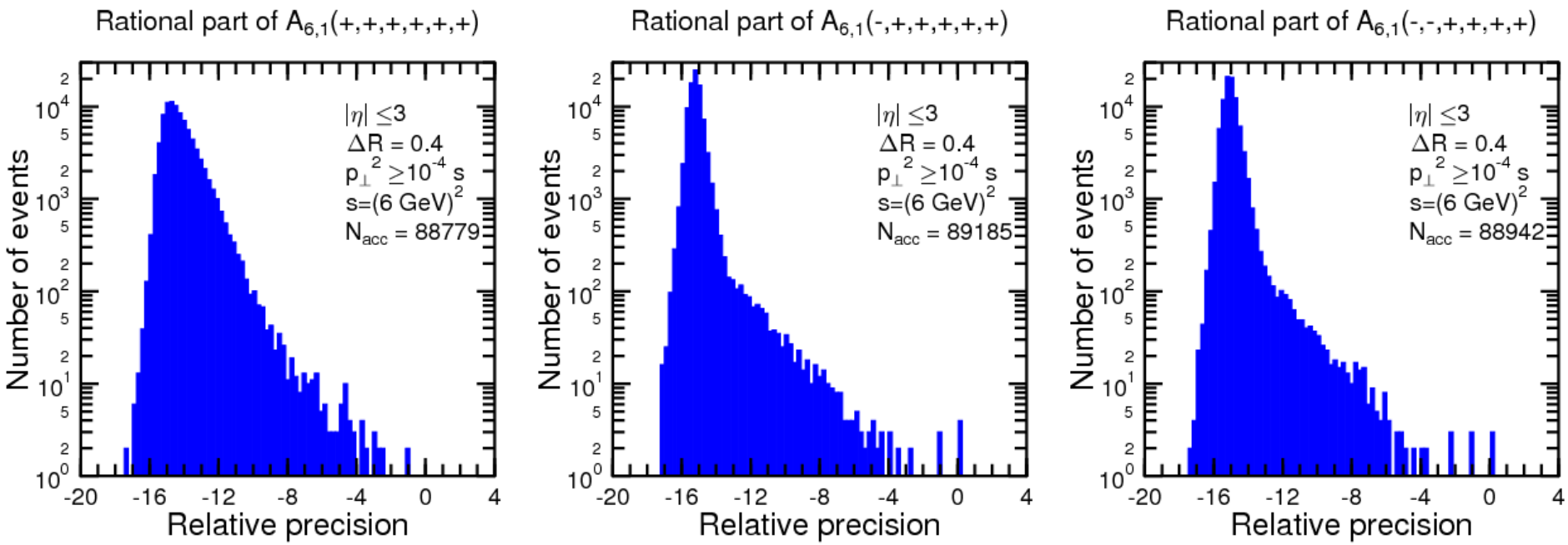

Precision plots for six-gluon amplitudes

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- Most implementations use subtractions:
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- Majority of calculations used dipole subtractions in the last decade (except MC@NLO), but it
  - cannot directly be generalized to NNLO

    ($\Longrightarrow$ antennae?)
  - inconvenient for matching with PS
  - becomes inefficient for multileg processes due to priliferation of dipoles ($\Longrightarrow$ FKS?)

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- Easy separation of soft & collinear singularities (to all orders)
- General subtraction scheme at NNLO
- New scheme at NLO that solves previous objections simultaneously
  - minimum number of subtraction terms at NLO (as FKS)
  - uses exact PS factorisations/convolutions (similarly to CS)
  - permutation symmetry of the SME (if any) is resepcted (as FKS)
  - works at any order in PT