The RAPGAP Monte Carlo generator: from ep to $\bar{p}p$

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- historically first version for hard diffraction in ep

  Rapidity Gap events

- developed to full ep MC generator (also non - diffraction)

- NOW also version from pp

  including hard diffraction and proton dissociation

- initial and final state parton showers (a la DGLAP)

- hadronization via JETSET/PYTHIA

RAPGAP in ep non - diffraction

- applicable for ep scattering
- for photo-production ($Q^2 \sim 0$) and DIS ($Q^2 > 0$)
- lowest order and $O(\alpha_s)$ processes included
- direct and resolved (virtual) photon processes ($O(\alpha_s^2)$)
- heavy quark production with massive matrix elements
- initial and final state parton showers (a la DGLAP)
- hadronization via JETSET/PYTHIA
- NLO corrections in Collins subtraction scheme for F_2 included
- redifinition of parton densities from $\bar{M}S$ scheme to BS - parton shower scheme

RAPGAP in ep diffraction

- photo-production and DIS
- direct photon and resolved (virtual) photon

- diffractive pdfs
  - ➤ H1 diffractive pdf's
  - ➤ ACTW diffractive pdf's
  - ➤ semi-classical diffractive pdf's Buchmüller, Hebecker (F.P. Schilling)
- hard diffraction via 2 gluon exchange
  - ➤ saturation model a la Wüsthoff,Golec-Biernat (H. Kowalski)
  - ➤ $q\bar{q}$ and $q\bar{q}g$ a la Bartels, Lotter, Wüsthoff, Jung
- p-dissociation
  - ➤ different approaches, tuned to measurements ala DIFFVM B. List (Y. Coppens, P. Thompson)
- π exchange ($\pi^{\pm}$, π^{0})

RAPGAP for $p\bar{p}$

- applicable for non - diffractive and diffractive $p\bar{p}$ scattering
  - ➤ only single diffraction yet

- $O(\alpha_s^2)$ processes included (non-diffractive, single diffractive):
  - ➤ $gg \to q\bar{q}, Q\bar{Q}, gg$
  - ➤ $qg \to qg$
  - ➤ $q\bar{q} \to gg, q\bar{q}$
  - ➤ $qq \to qq$

- diffractive pdfs available

- double diffraction missing

- p-dissociation as measured... in various approaches

- π exchange

- diffractive W, Higgs ... still missing

RAPGAP

- RAPGAP 3.1 available under:
  `http://www-h1.desy.de/~jung/rapgap/`
- using PYTHIA 6.2 for fragmenation