General Purpose MC
Forward Physics

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- why should we care?
- what is in the models?
- which data to constrain/test models?
- summary

why should we care?

motivation

- test-bed for soft-to-hard QCD:
  (diffraction vs. perturbation theory)
- modelling of high-energetic cosmic rays:
  (validate and tune models in laboratory)
- photon physics:
  (FS produced in forward direction)

what's in the models?

(bird's eye view)

general-purpose Monte Carlo's

HERWIG, PYTHIA, & SHERPA

- forward physics driven by low-$p_\perp$ QCD
  $\longrightarrow$ link with MPI and their (perturbative) modelling
  $\longrightarrow$ link with BFKL/saturation physics (?)
- diffraction added "ad hoc"
  $\longrightarrow$ no true first-principles model to link with perturbative QCD
  $\longrightarrow$ must improve (links with) theory
- add-on: hadronization & beam remnants
  $\longrightarrow$ phenomenological models only

cosmic ray Monte Carlo's

- usually build with inclusive/elastic cross section/diffraction in mind
  $\longrightarrow$ based on Reggeon physics
- perturbative/hard physics added "ad-hoc" $\longrightarrow$ no true first-principles model to link soft/hard QCD
  $\longrightarrow$ must improve (links with) theory
- hadronization etc. through interfaces to general-purpose MC

(effectively PYTHIA)

what informs the models?

(bird's eye view)

data situation

- in the absence of (quantitative) 1^{st} principles, need data
- tool-chain considerations:

  general-purpose MC $\longrightarrow$ RIVET $\longleftarrow$ HEPDATA
- absence of data/analysis code for some core meadurements from HERA, Cosmic Rays, fixed target ...

  $\longrightarrow$ would be great to fix this

summary

summary

- forward physics often overlooked

  (certainly true for SHERPA, also for HERWIG?)
- from a theory point of view:

  wild dream: construct an integrated QCD-inspired parton-based model to combine soft and perturbative physics
- word of warning:

  if you want research, you need to fund the researchers