QED FSR in SHERPA

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- Introduction
- Drell-Yan production
- W production

"Mechanics" in SHERPA

- SHERPA uses Yennie-Frautschi-Suura algorithm

  (Yennie, Frautschi, Suura, Annals Phys. 13 (1961) 379; Schonherr, FK, JHEP 0812 (2008) 018)

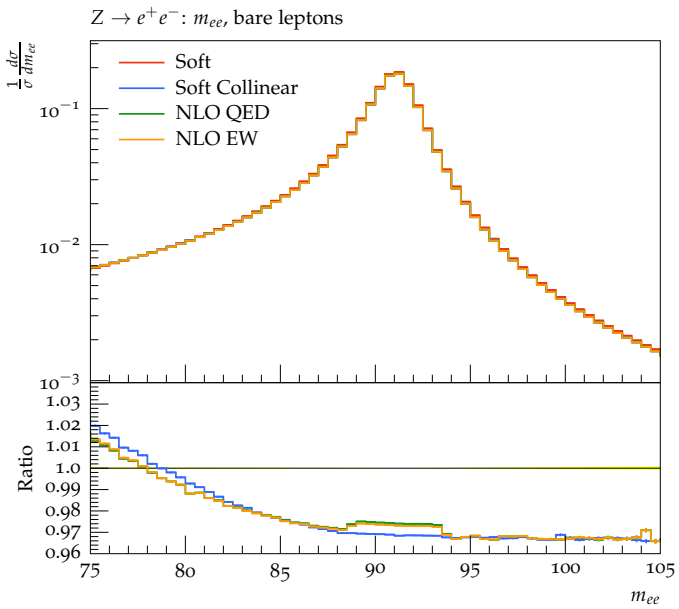
  - exponentiates eikonal and corrects by fixed-order perturbation theory
  - in real emissions: corrects every emission
- SHERPA default for fixed-order corrections:
  - NLO QED for leptonic Z and τ decays
  - otherwise Catani-Seymour splitting kernels

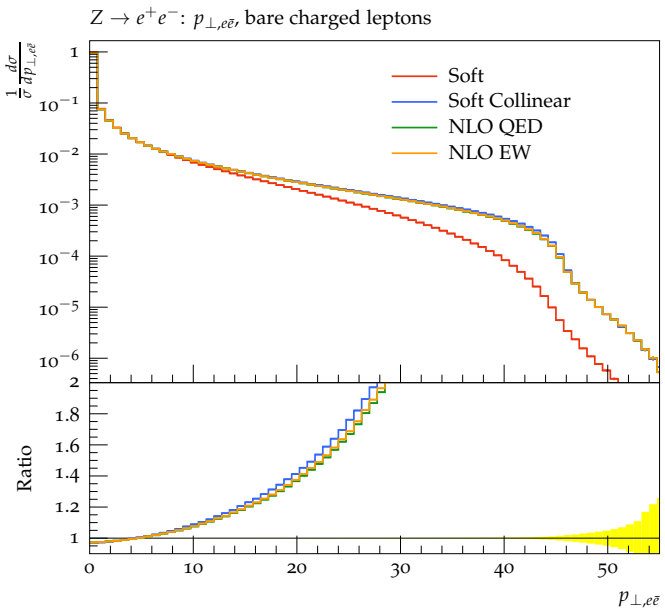
  (capture also hard collinear logs)
- current development: inclusion of NLO EW, NNLO QED for DY

  (work mainly by R.Linten, results below)
- virtual corrections obtained from OPENLOOPS

Soft approximation vs. exact higher orders

- bare electrons, eikonal vs. parton shower vs. exact
- apply higher-order corrections only in range of Γ arond M





Exact higher orders: NLO vs. NNLO

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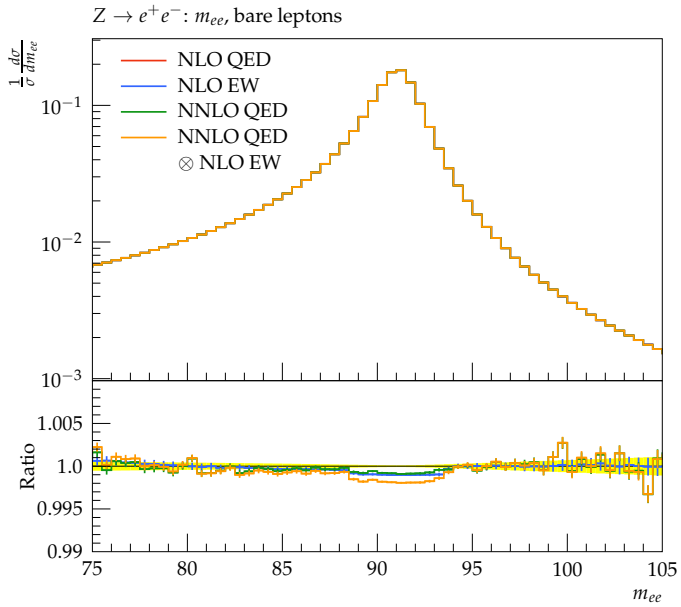

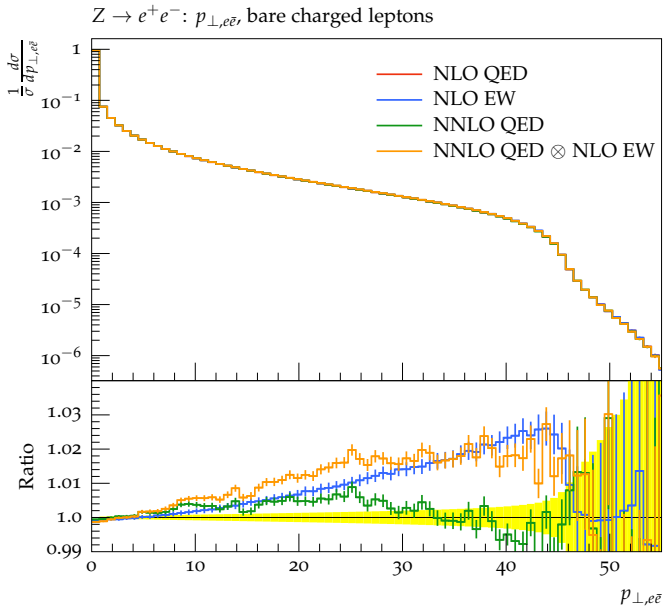

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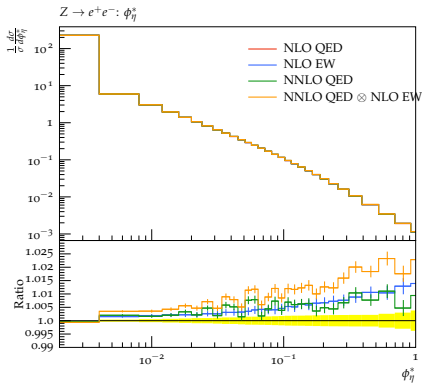

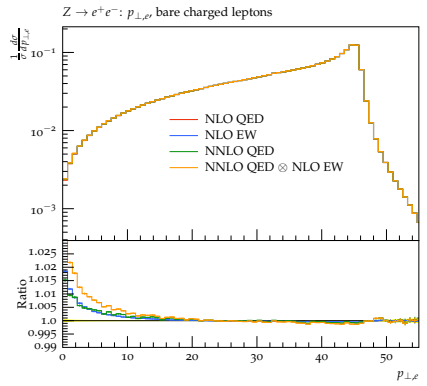

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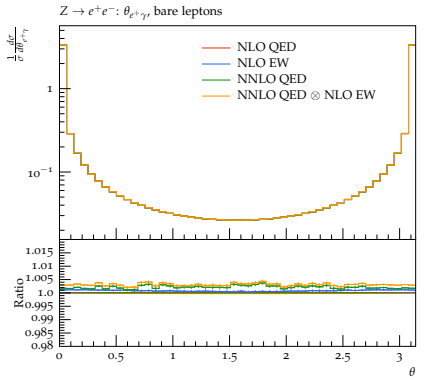
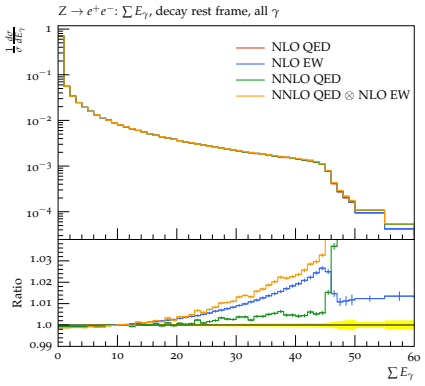
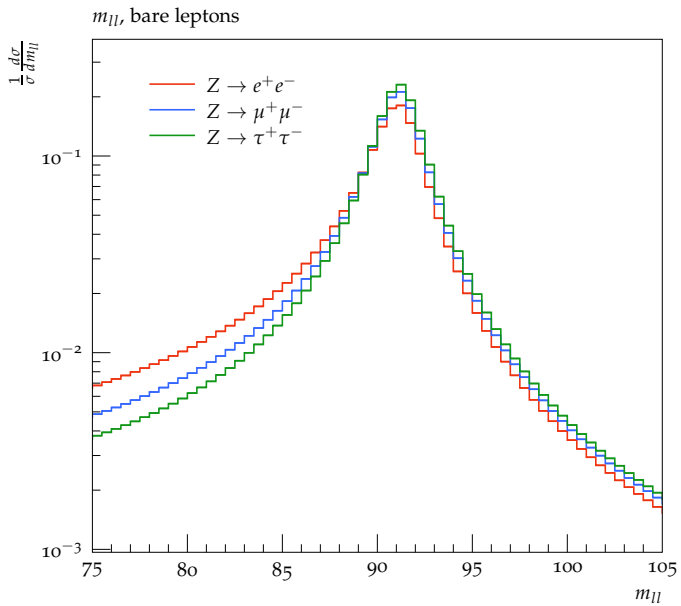
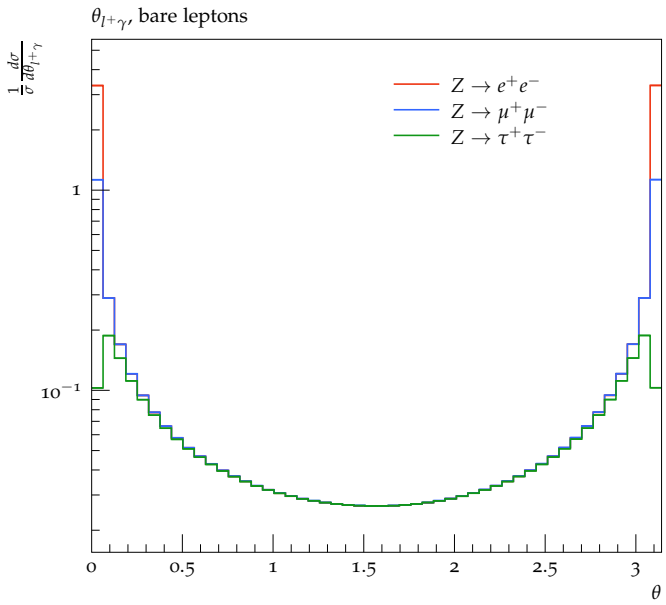




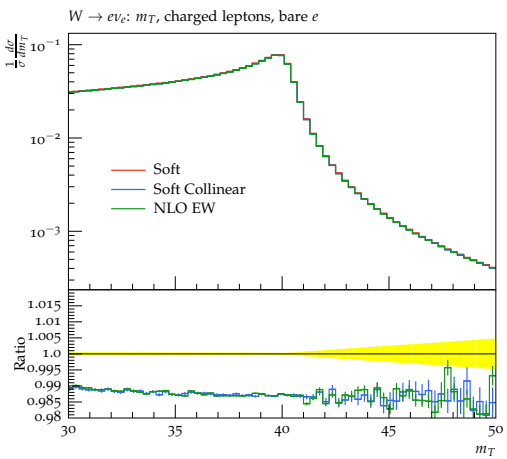
Impact of lepton masses

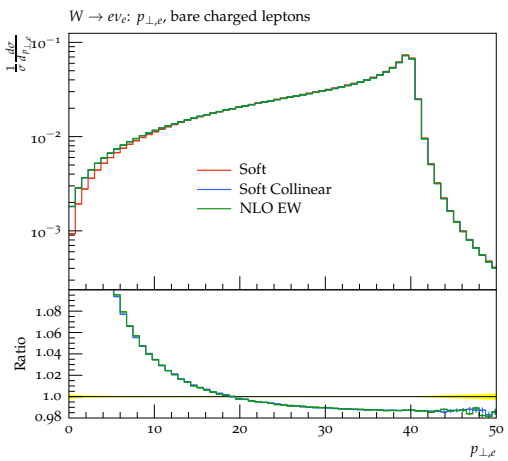


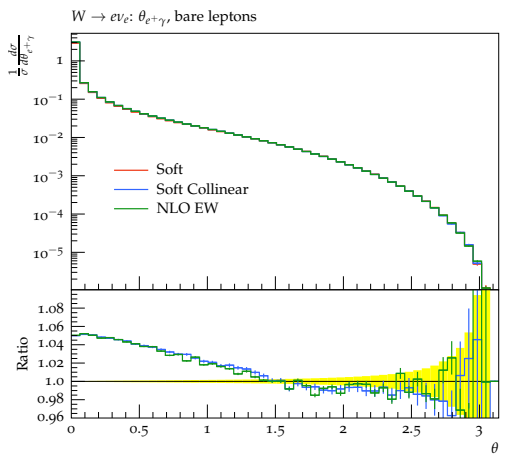


Exact higher orders: NLO vs. NNLO

- bare electrons, eikonal vs. parton shower vs. exact
- apply higher-order corrections only in range of Γ arond M
- weak and electromagnetic corrections entangled by gauge invariance







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