LHC activities in the MPI theory group

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General overview of activities

- Higher-order electroweak corrections
- Precision Higgs physics
- SUSY phenomenology
- Automization and calculational methods
- Perturbative QCD calculations
- Hadron physics

Higher-order electroweak corrections

- two-loop corrections to $\sin^2\theta_{\mathrm{eff}}^{\mathrm{lept}}$ (Hollik, Meier)
- EW corrections at high energies (Pozzorini)
- EW corrections to gauge-boson pair and gauge-boson + jet production (Pozzorini)
- mixed EW/QCD NLO effects in $\mathrm{pp} \to \mathrm{t\bar{t}}$ (Hollik, Kollar)
- precision calculations for Drell-Yan-like W/Z production (Dittmaier, Hollik)

Precision Higgs physics

- precision Higgs mass predictions in the MSSM
  $\hookrightarrow$ development of FeynHiggs (Hahn, Hollik)
- precision calculation for $\mathrm{H} \to \mathrm{WW/ZZ} \to 4$ fermions
  $\hookrightarrow$ event generator Prophecy4f (Bredenstein, Dittmaier)

SUSY phenomenology

- corrections to squark-pair production (Hollik, Kollar)
- higher-order SUSY effects in EW precision observables (Hollik, Weber)
- SUSY-QCD corrections to Higgs production, e.g. $\mathrm{pp} \to \mathrm{t\bar{t}H}/\mathrm{b\bar{b}H}$ (Dittmaier, Hollik, Rauch)

Automatization and calculational methods

- automated one-loop corrections for SM/MSSM processes
  $\hookrightarrow$ development of FeynArts, FormCalc, LoopTools (Hahn)
- methods for NLO corrections to multi-leg processes (Dittmaier)

Perturbative QCD calculations

- fragmentation functions at very small x beyond DGLAP (Ochs)
- jet physics (b-quark jets versus light-quark jets, rapidity gaps, etc.) (Ochs)
- heavy-quark mass determination (Hoang)
- NLO QCD corrections to specific processes (Dittmaier)
  e.g. $\mathrm{pp} \to \mathrm{t\bar{t}H}/\mathrm{b\bar{b}H},\ \mathrm{pp} \to \mathrm{t\bar{t}} + \text{jet}$

Hadron physics

- semileptonic B decays (Hoang)
- chiral resonance effective theory (Ruiz-Femenia)
- glueballs (Ochs)