# Probing Standard-Model Higgs Substructures using Tops and Weak Gauge Bosons

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16th of March 2021
Dortmund/Online
Germany

UNI GRAZ

NAWI Graz
Natural Sciences

# What’s up?

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See review for background!

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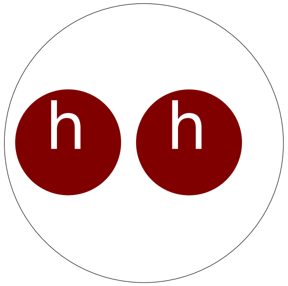

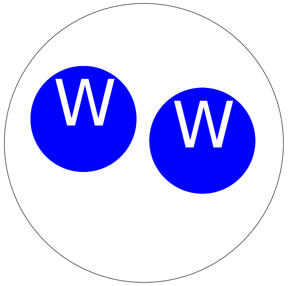

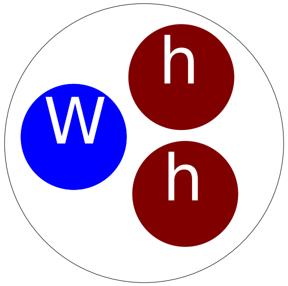

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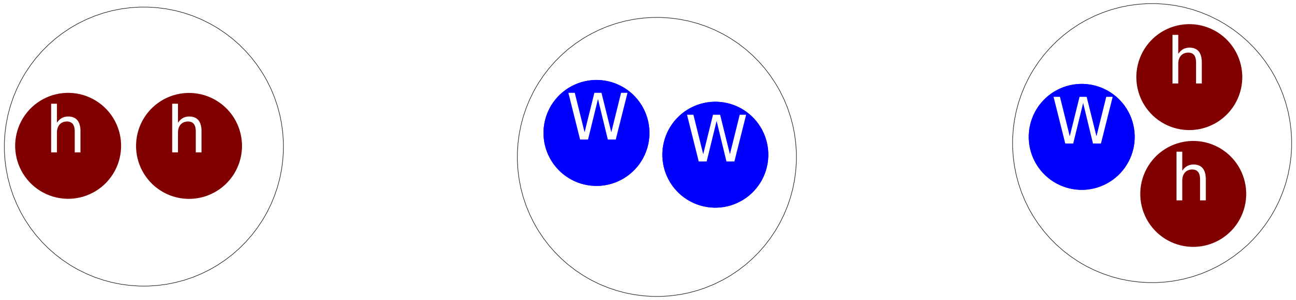

- Why does perturbation theory work?
  - Fröhlich-Morchio-Strocchi mechanism

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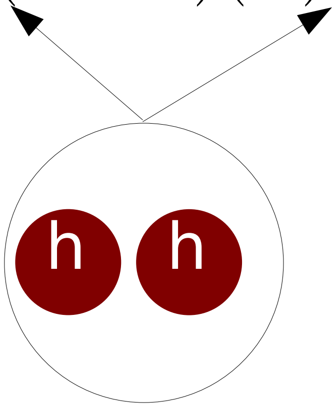

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2 x Higgs mass:
Scattering state

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Standard
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Deviations: 2009.06671

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  - Global SU(3) generation
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- Can this be true? Lattice test

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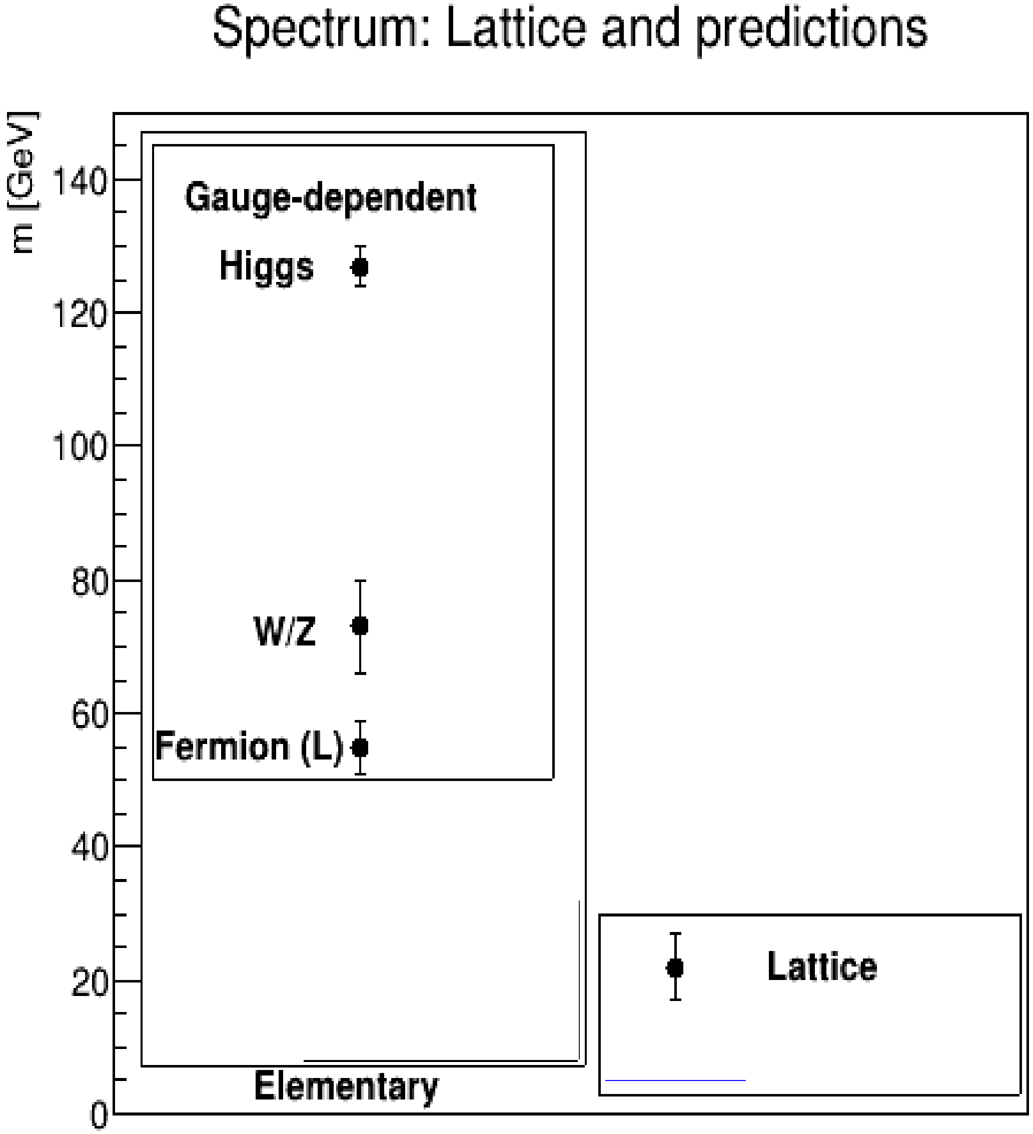

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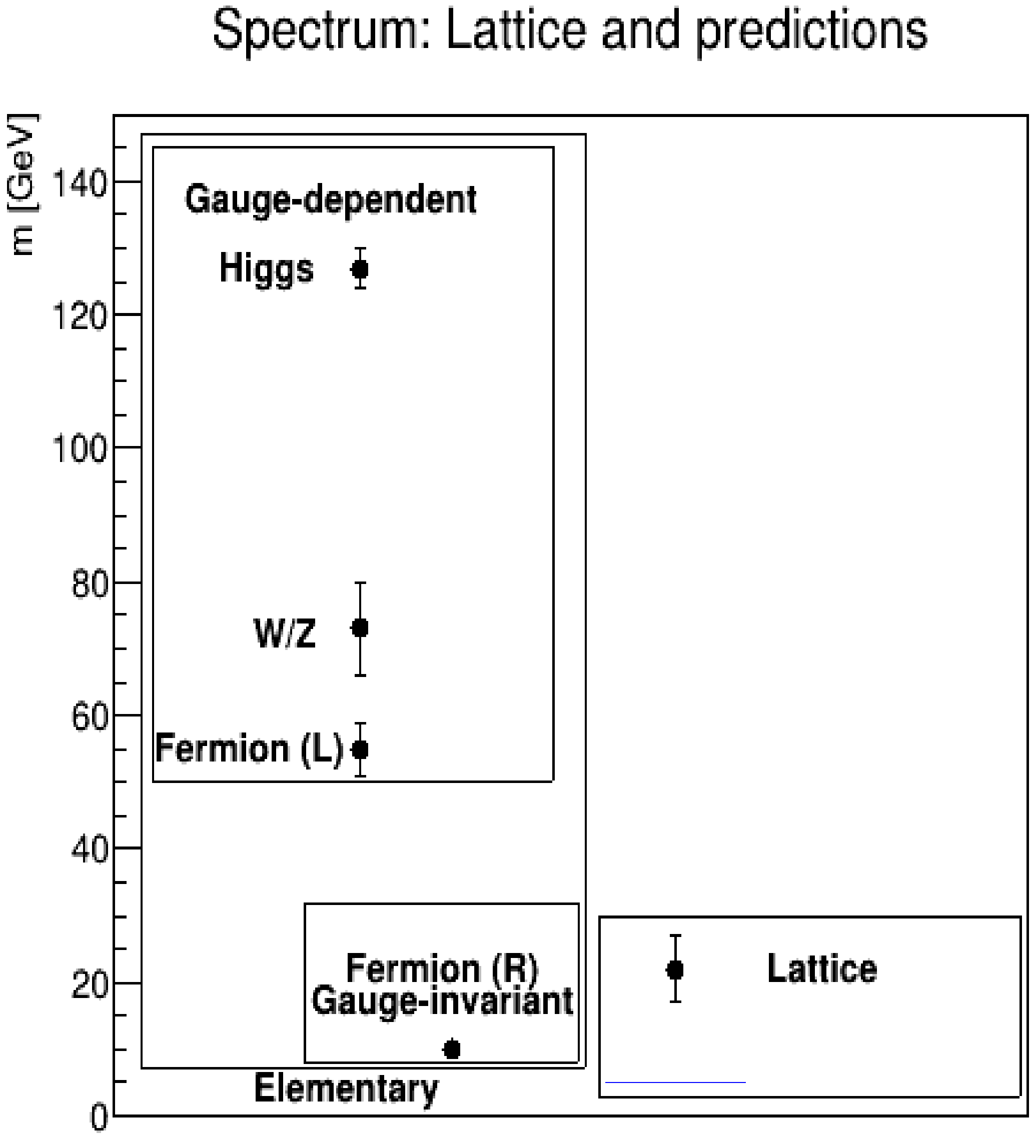

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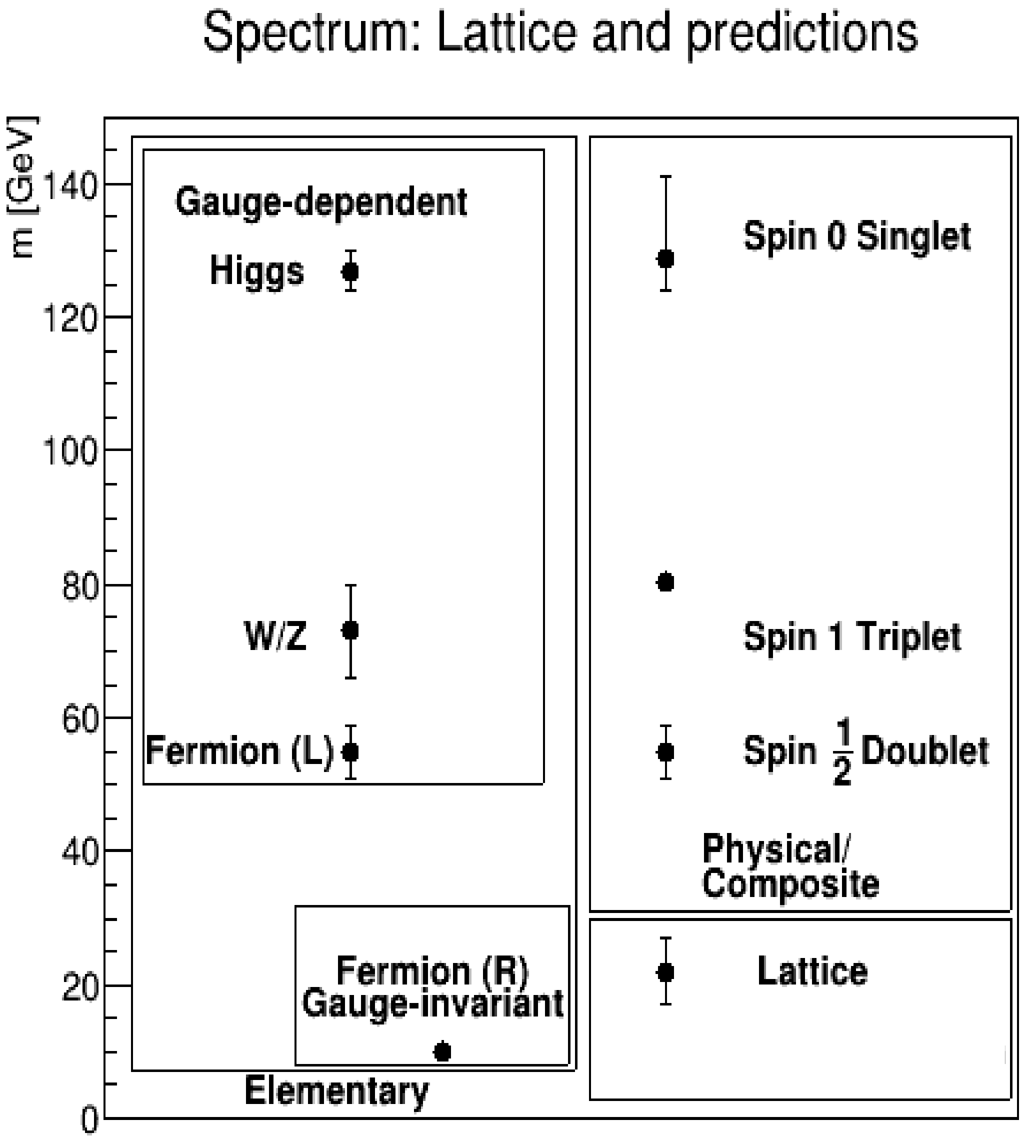

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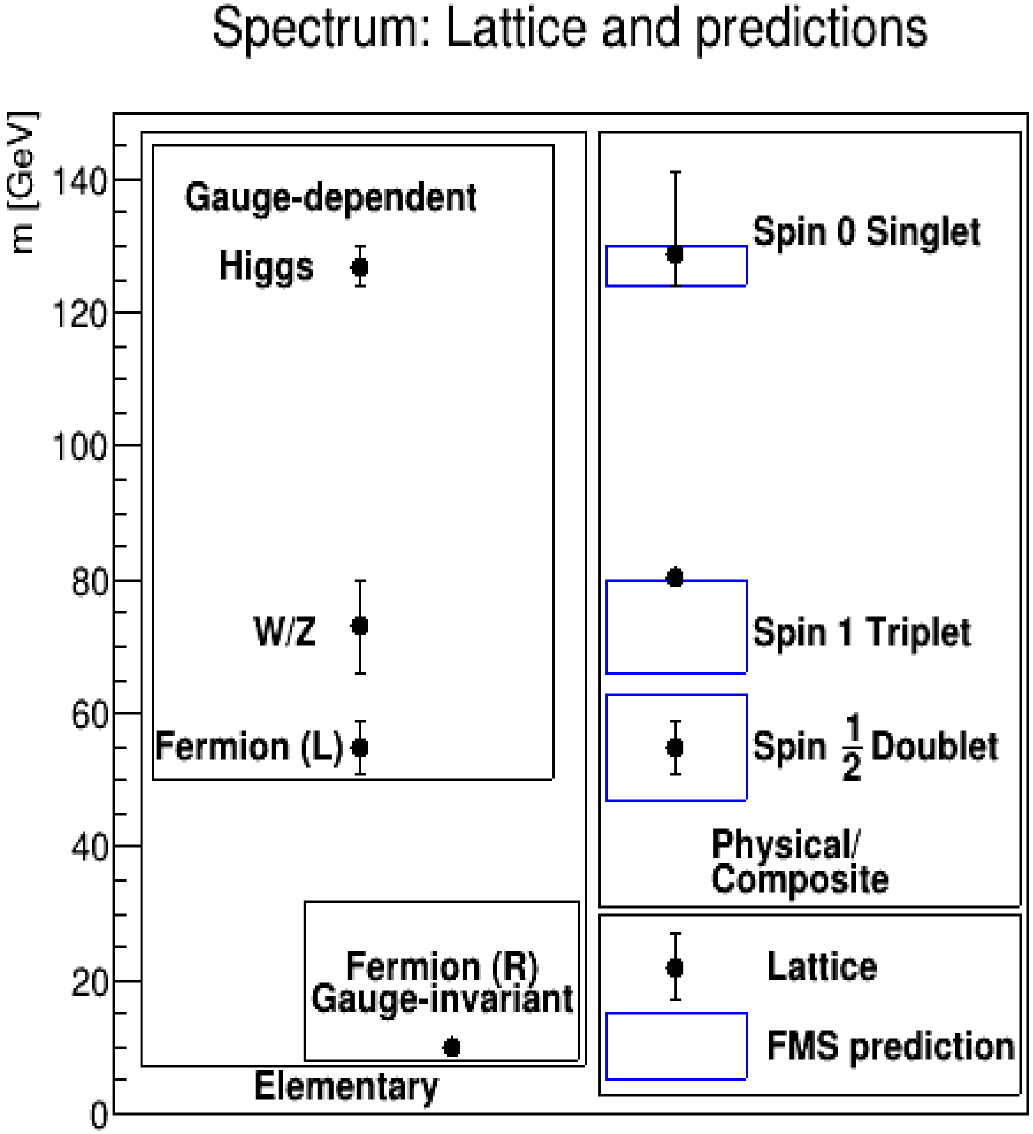

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- Valence Higgs detectable at LHC?
  - Strong couplings to Higgs: tops, weak gauge bosons

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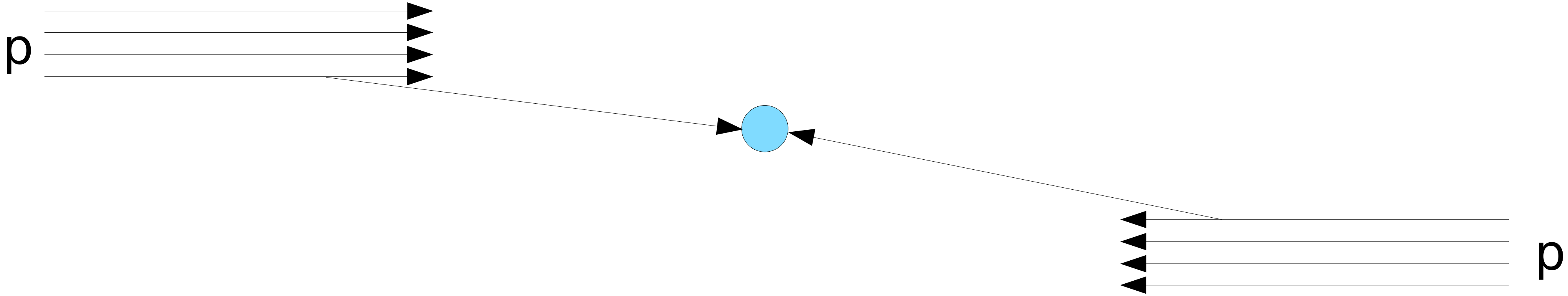

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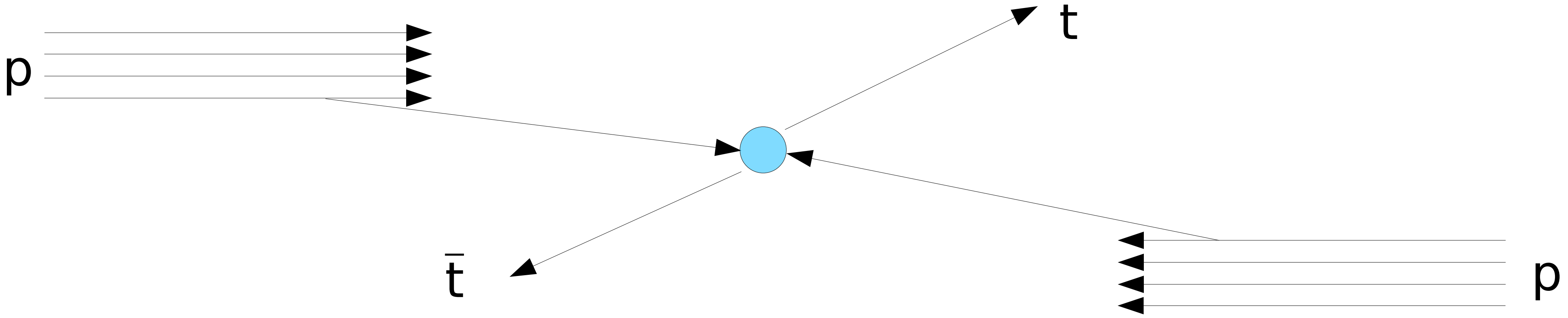

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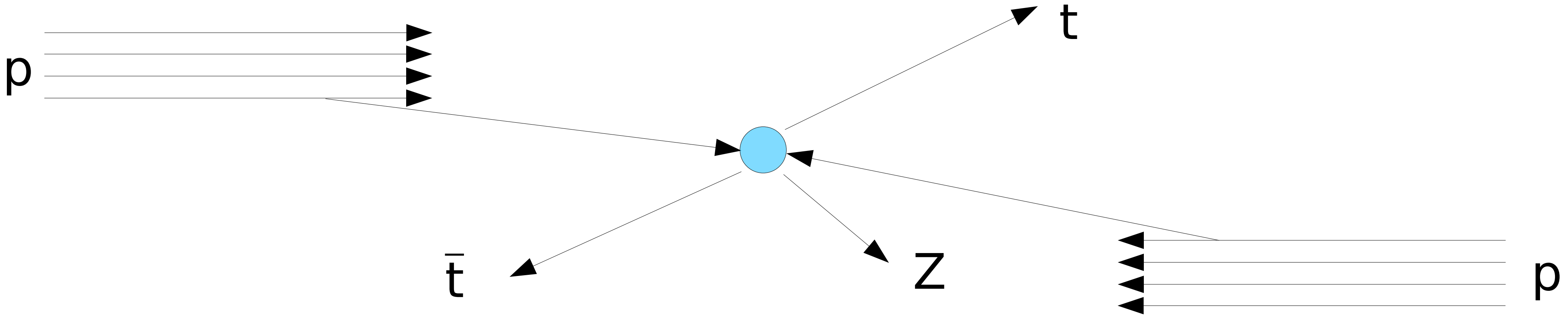

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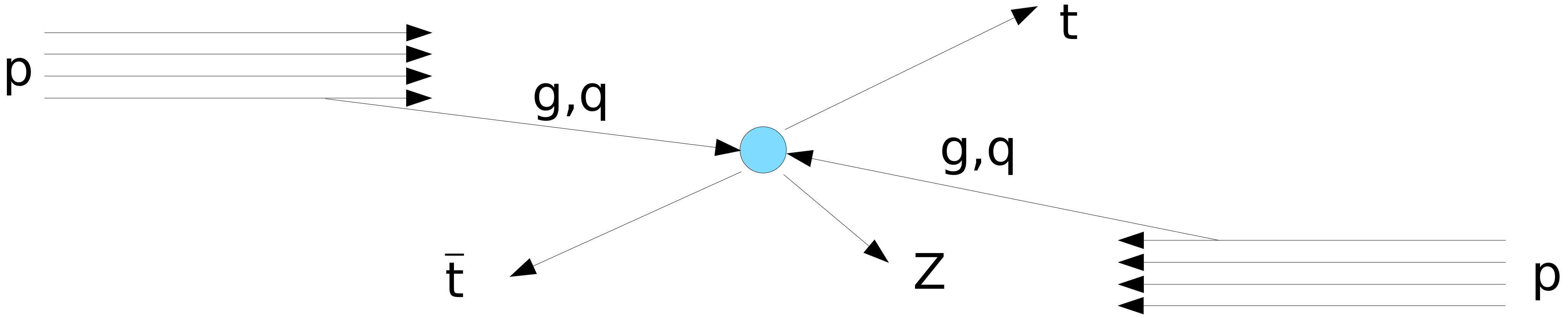
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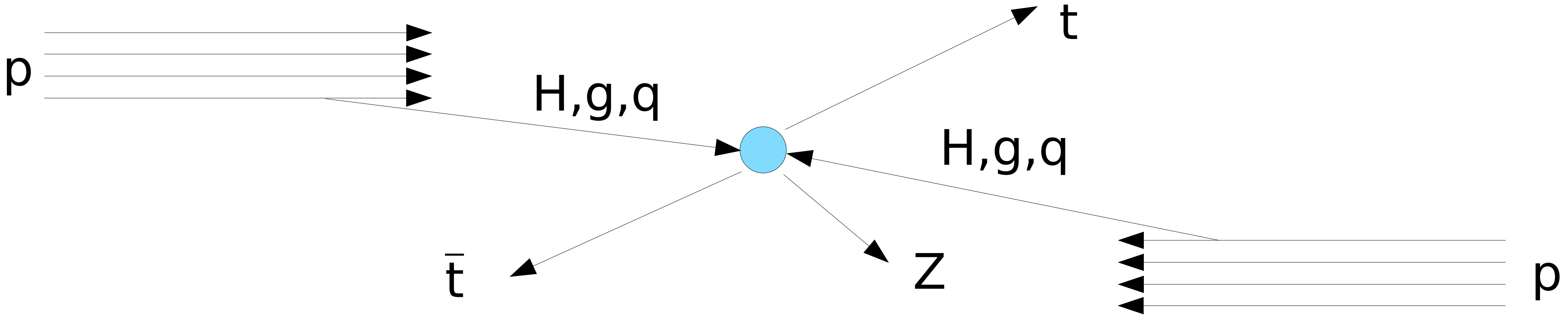

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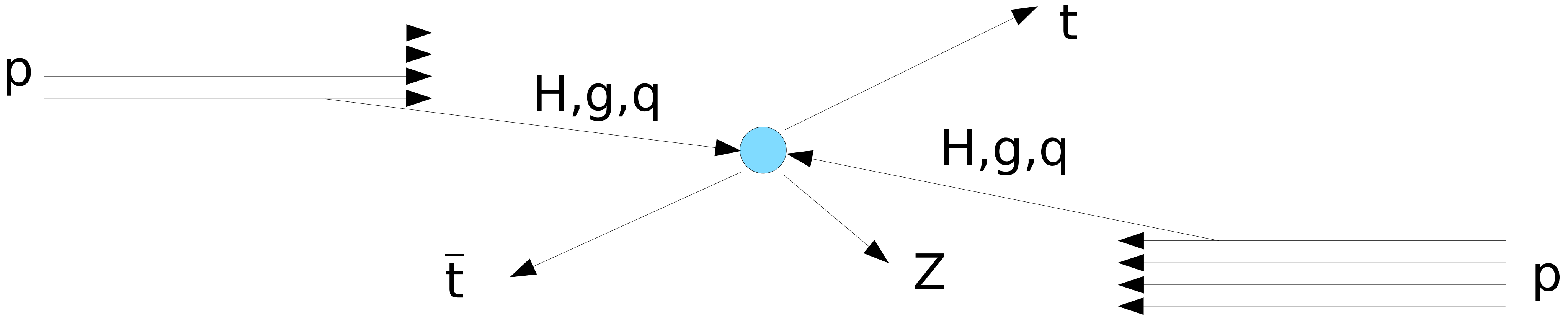

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    - Tree-level only
    - Standard-model dominated by gluons
      - Initial states $q\bar{q}$, gg, gH, HH

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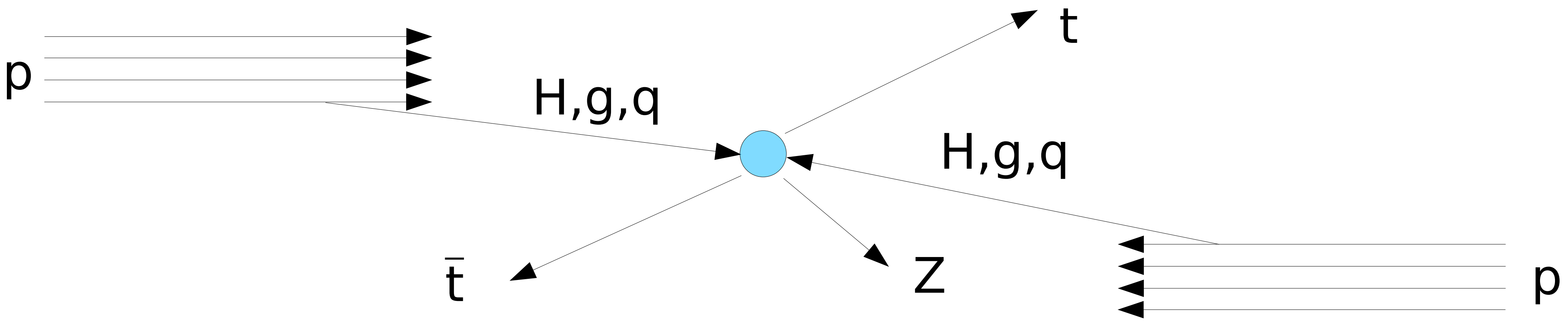

- Hard process calculated by Herwig 7
  - Modified version to include Higgs initial state
    - Tree-level only
    - Standard-model dominated by gluons
      - Initial states $q\bar{q}$, gg, gH, HH
  - PDF ansatz for valence Higgs

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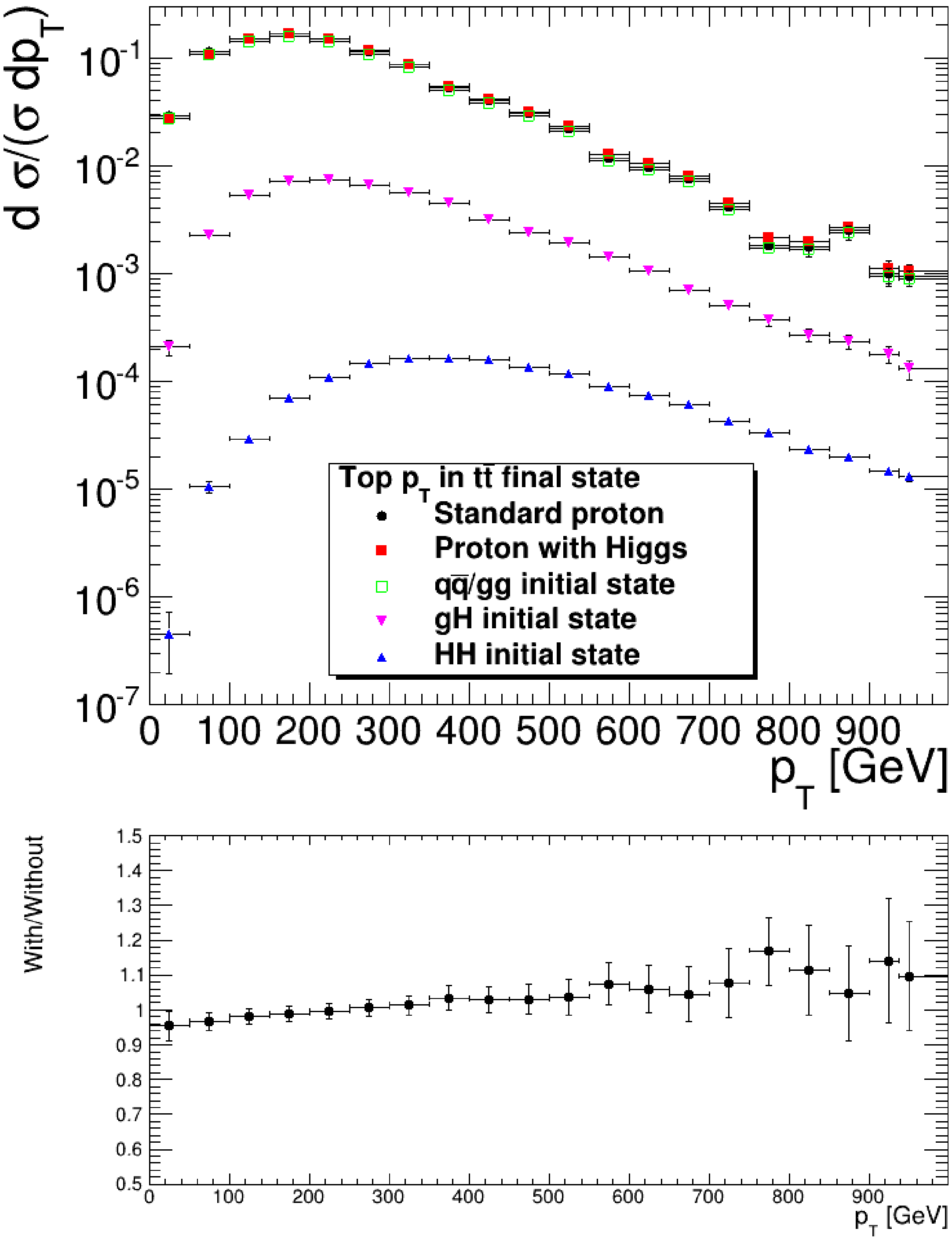

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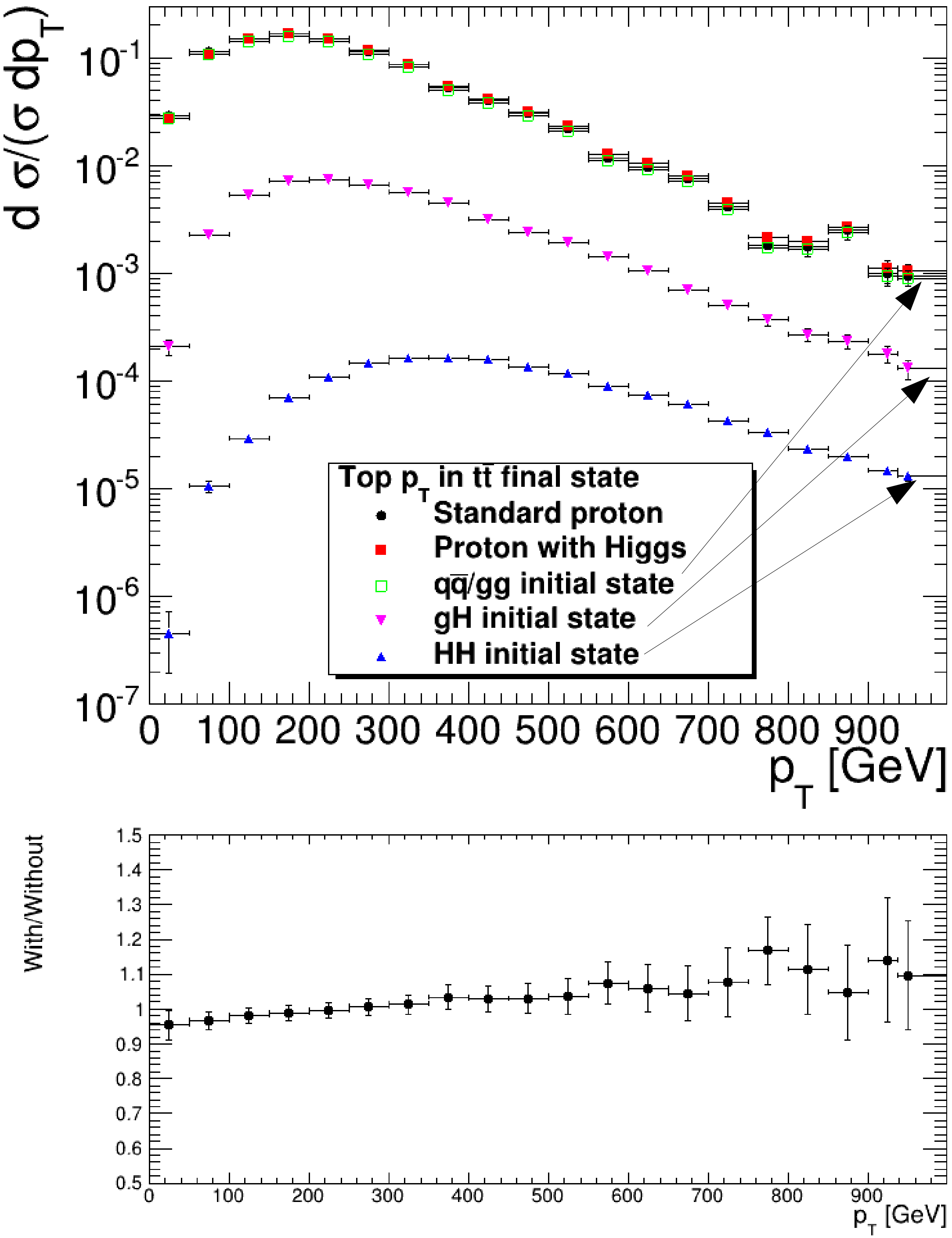

Individual contributions
Note: Less from ‘ordinary’ quarks and gluons
Higgs initial states harder

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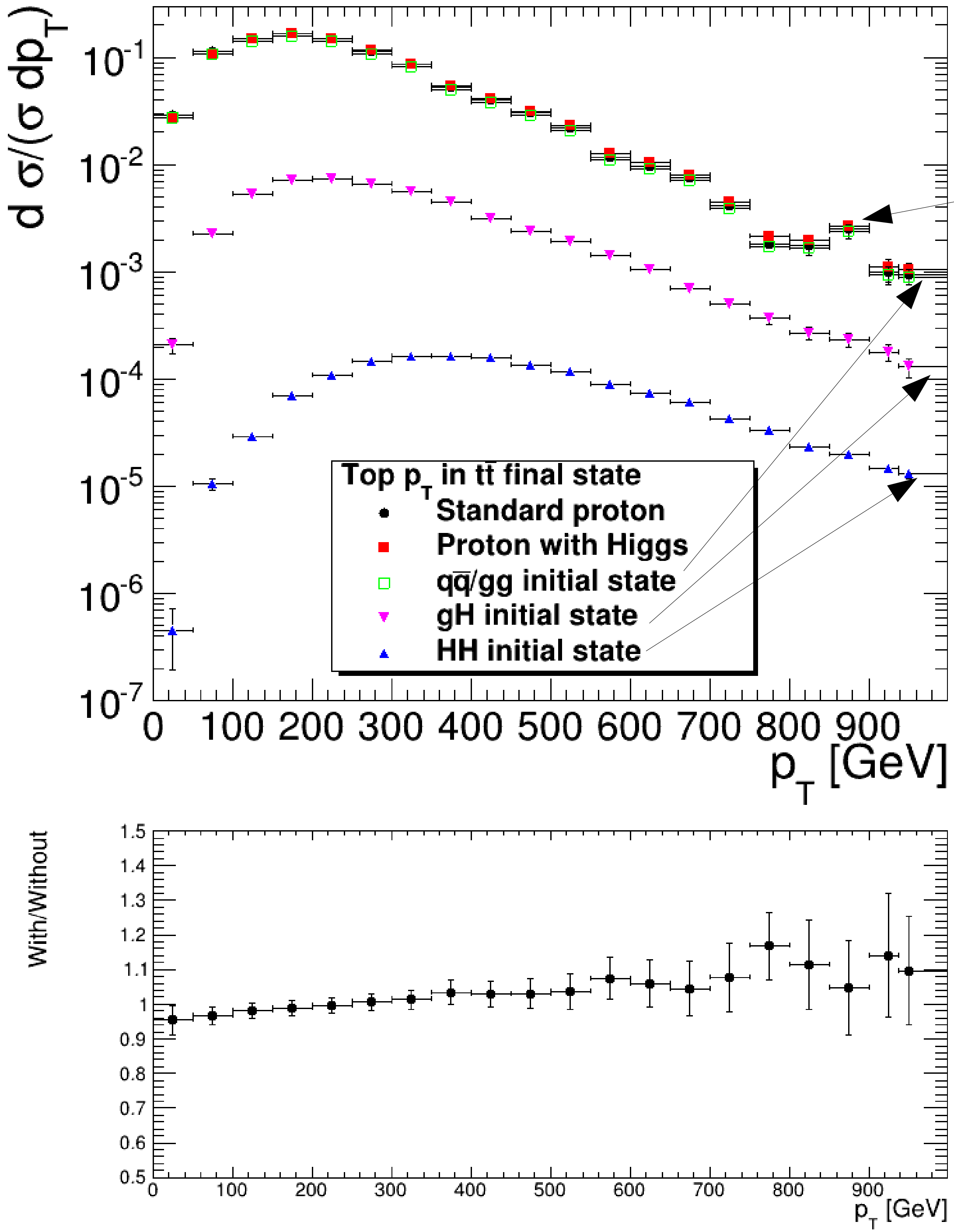

Results from a
Candidate PDF
- done for $\bar{t}t$ and $\bar{t}tZ$

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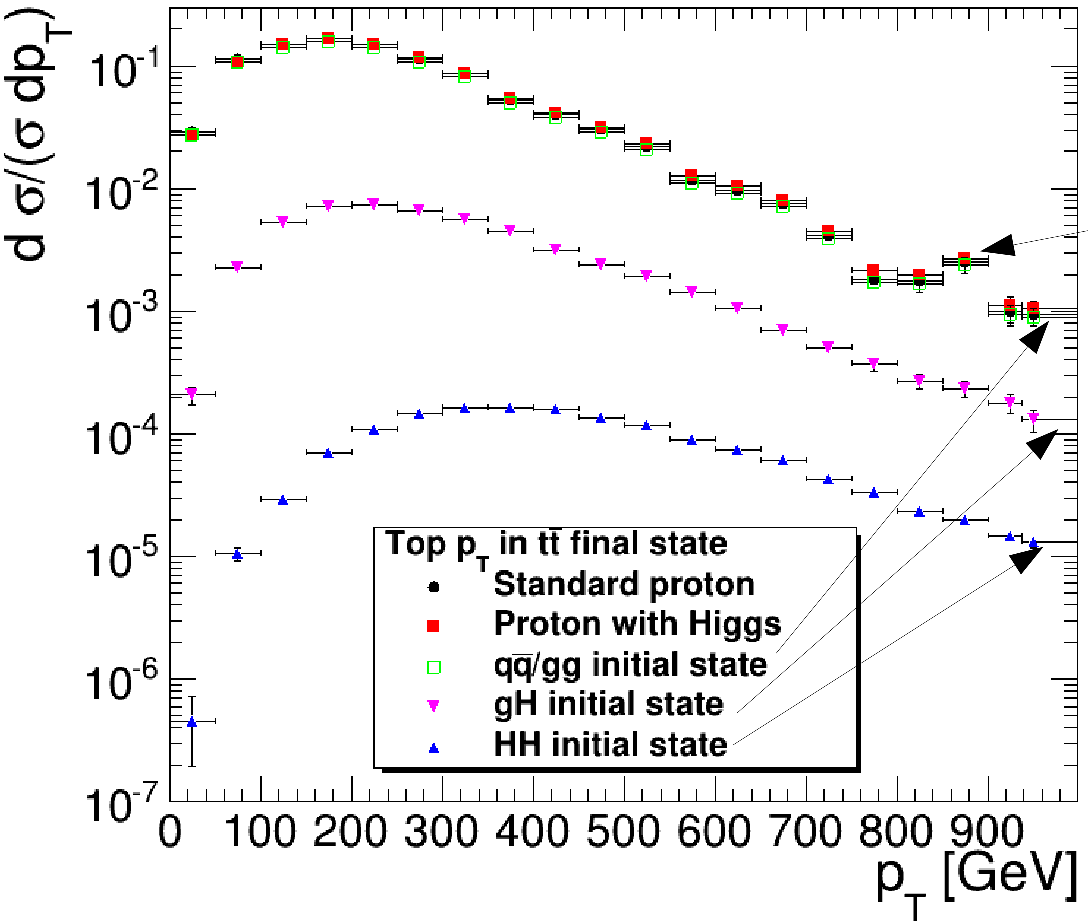

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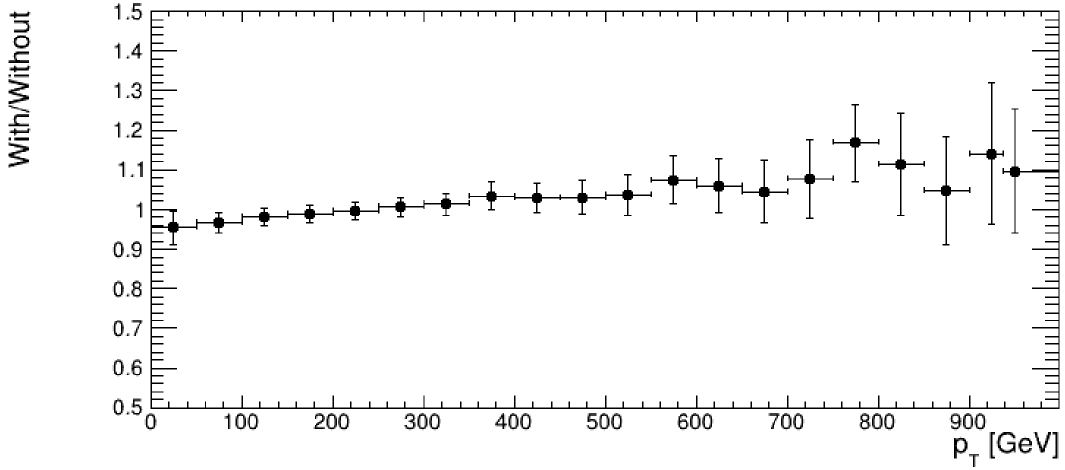

Relatively small deviations,
becoming stronger at larger
momenta – generic?

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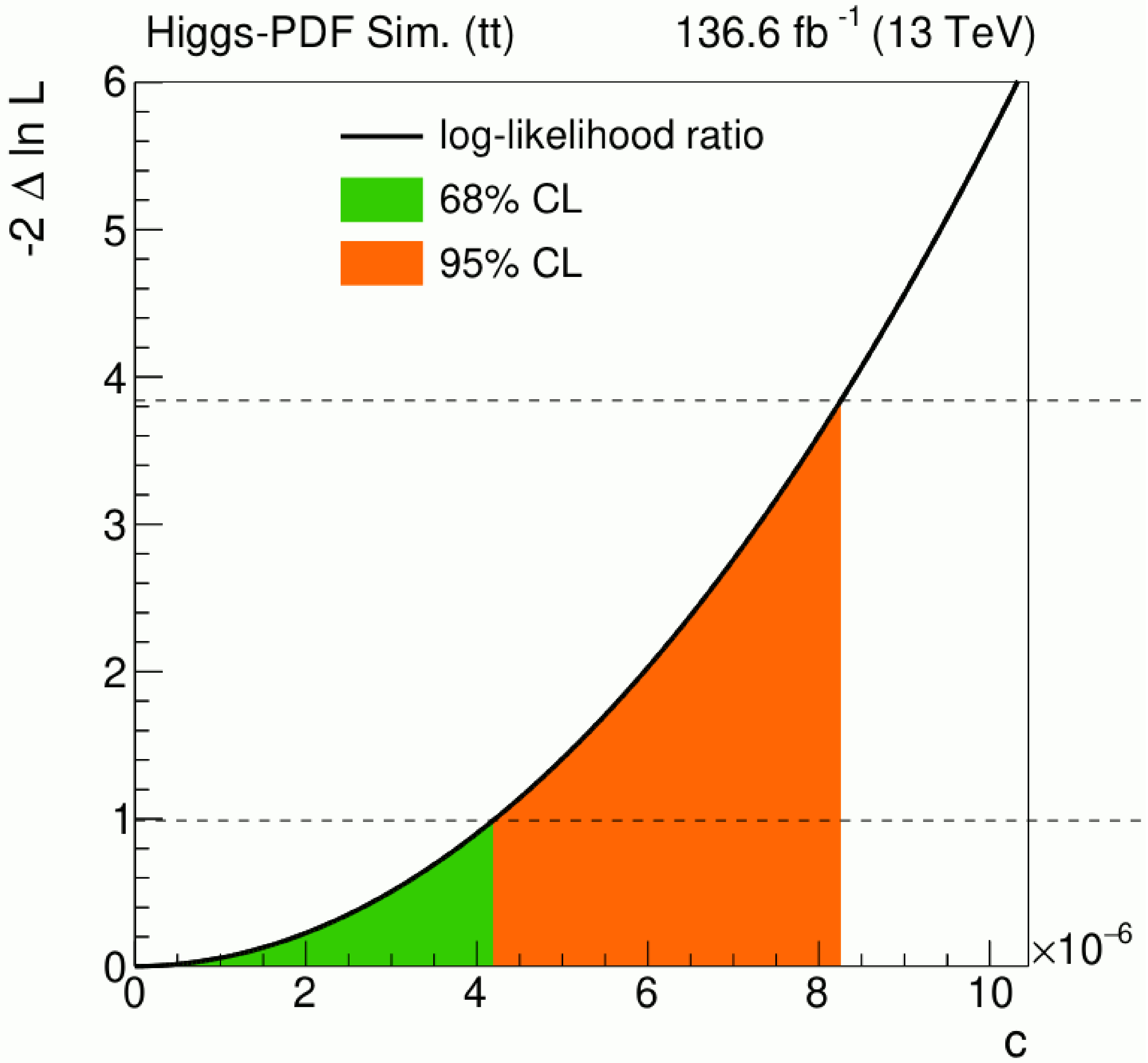

'Amount' of Higgs in the proton

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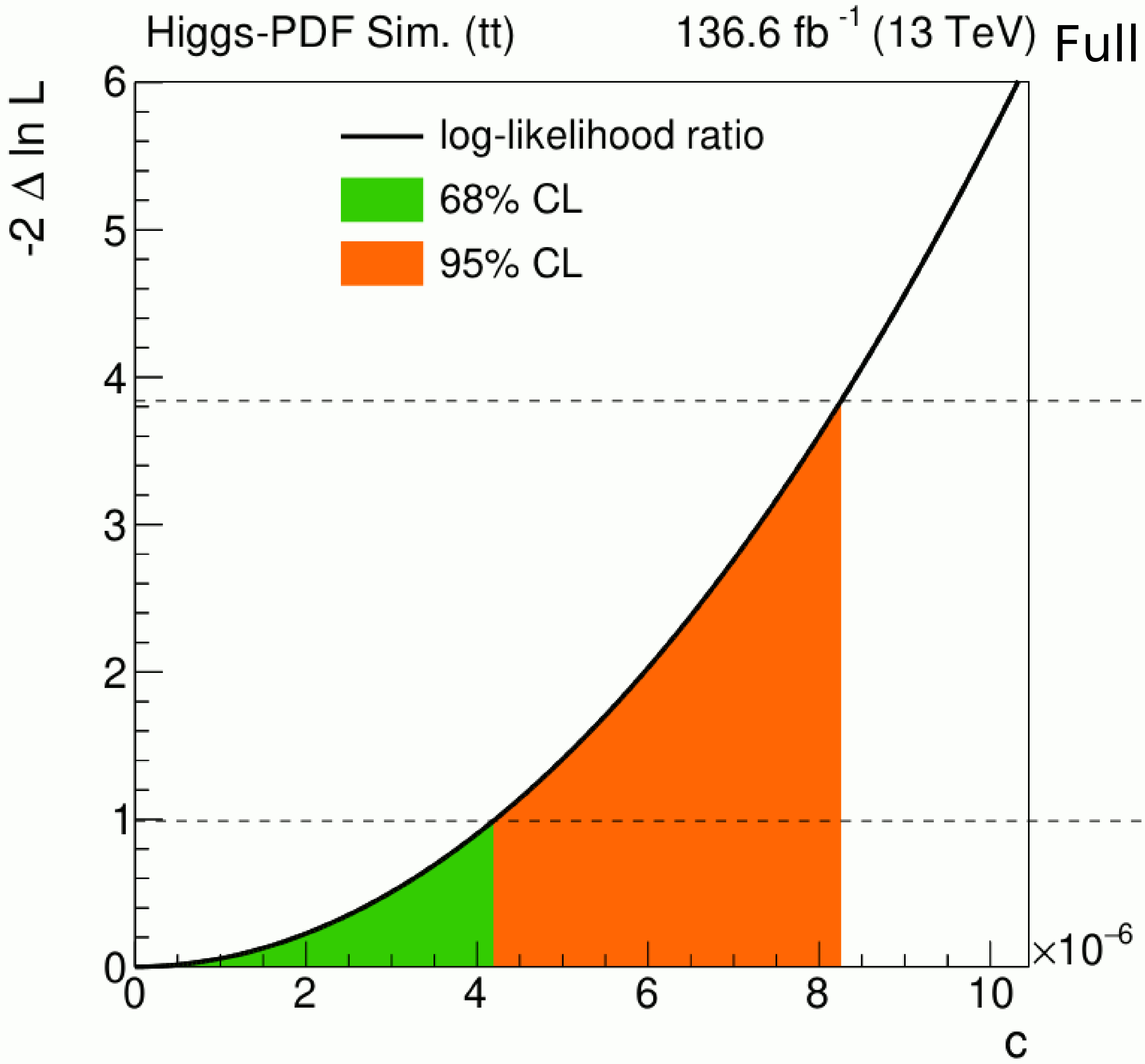

Full run 2 lumi

'Amount' of Higgs
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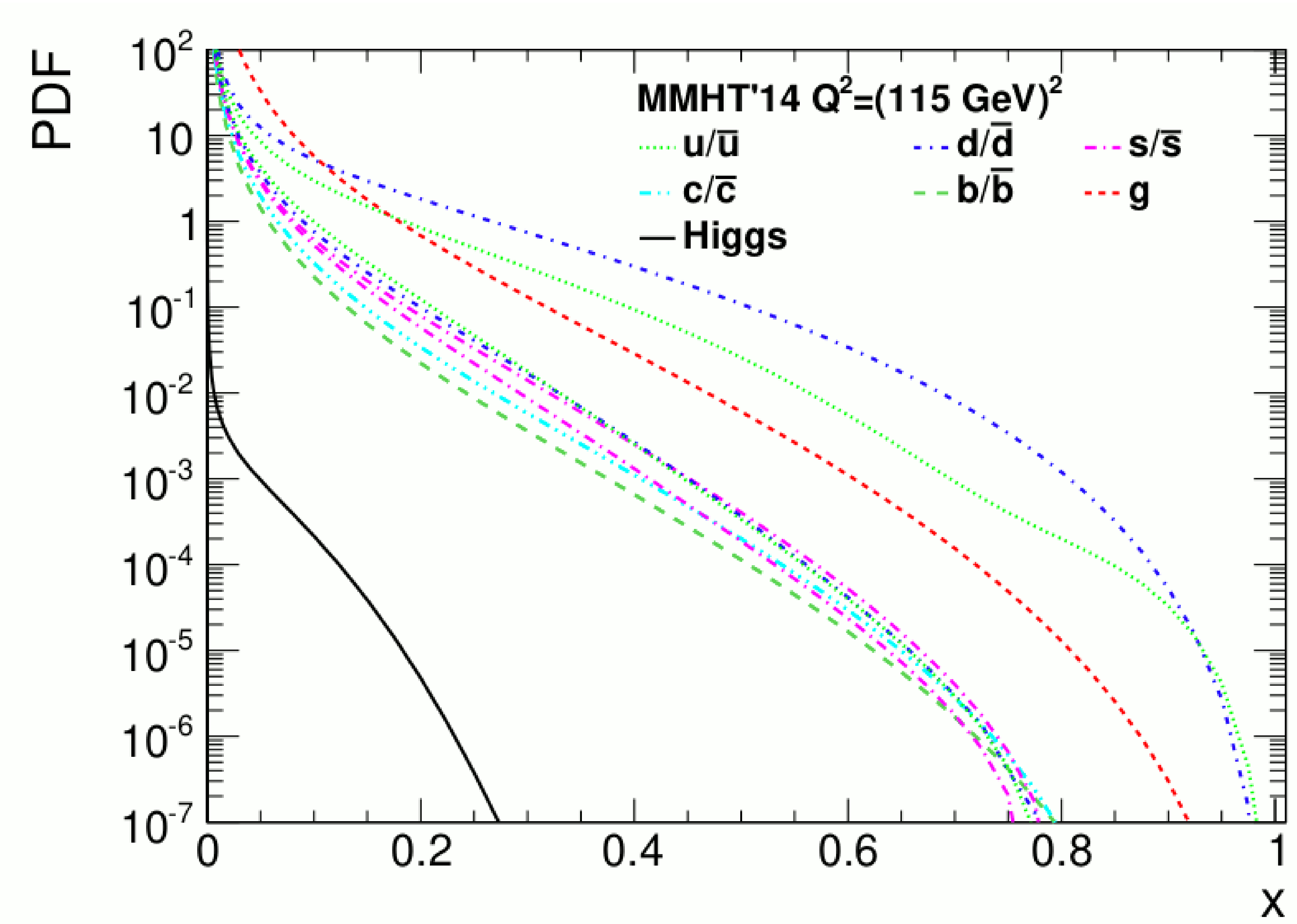

Strongly suppressed, as expected for mass – evolution to FCC?

# Further consequences

- In SM physics: Quantitative changes
  - Anomalous couplings/form factors
  - Different high energy behavior
  - More: See 2009.06671, 1811.03395

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  - Anomalous couplings/form factors
  - Different high energy behavior
  - More: See 2009.06671, 1811.03395

- In BSM physics: Qualitative changes
  - Different spectrum
  - Affects viability of BSM Scenarios
  - More: See 2002.08221, 1912.086680, 1804.04453, 1709.07477