VH plans for YR5

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24/10/2024

# Differential NLO prediction for ggZH

- Differential NLO prediction: natural progression w.r.t. YR4

- NLO/LO k-factor depends on

  - variable of choice

  - selection conditions on kinematics

- Cross-check planned between Heinrich, Jones et al. (2022) and Vitti, Gröber et al. (2022)

- Minimum update expected:
  Single- or double-differential k-factor

- Optimistic scenario:
  Calculation available for full event generation (e.g. in POWHEG)
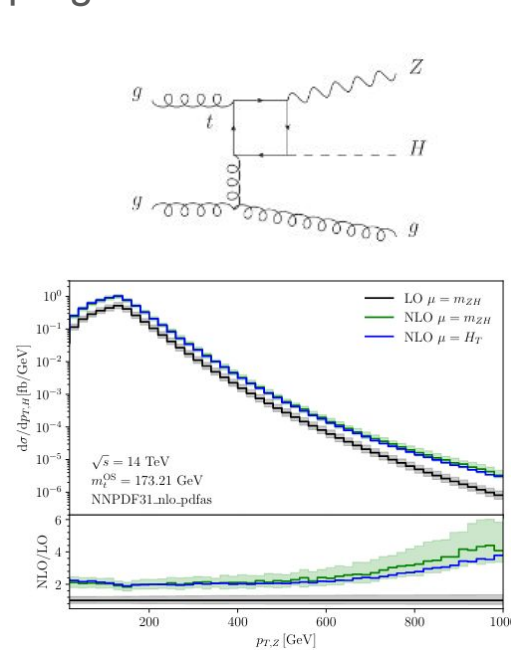
Heinrich, Jones et al. (2022)
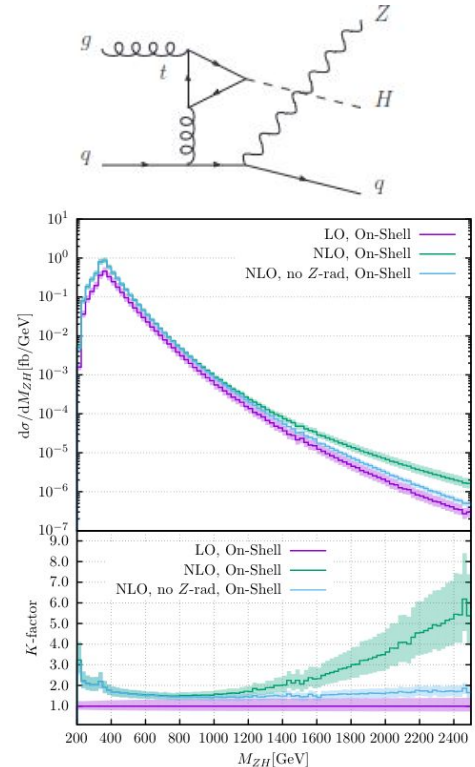
Vitti, Gröber et al. (2022)

# Comparing different generators and uncertainties

- Comparison of NLO predictions from POWHEG, Sherpa, MC@NLO
  → relative comparison on fraction of events with negative weights
  (MC@NLO and Sherpa are less popular in experiment due to negative weight issues)

- Comparison with different parton showers in NLO+PS predictions:
  PYTHIA8 vs HERWIG7

  - POWHEG+PYTHIA8 vs POWHEG+HERWIG7
    YR4 has POWHEG+PYTHIA6, MG5_aMC+PYTHIA8/HERWIG7 predictions

- Parton shower variation in NNLOPS predictions. Try NLL PS - Panscales?
  - Inclusion of parton shower uncertainty on predictions from generators
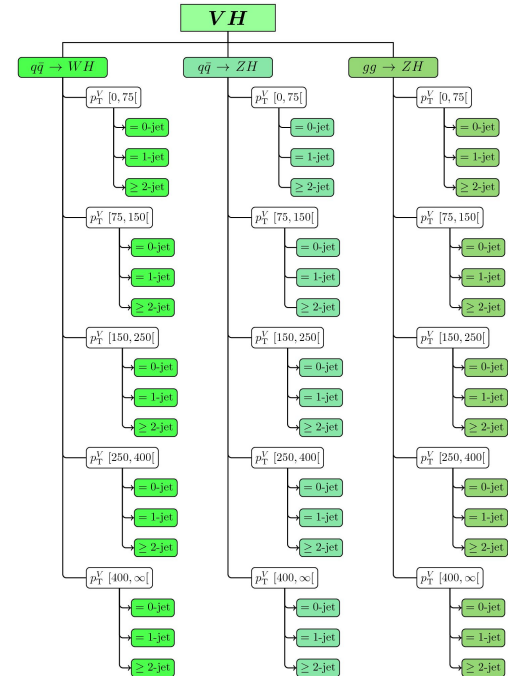
STXS 1.3 predictions

- Include predictions in STXS 1.3 bins in YR5: cross section + uncertainty
- Could serve as a standard reference for future

Proposal for STXS 1.3

Fine split from
ATL-PHYS-PUB-2018-035
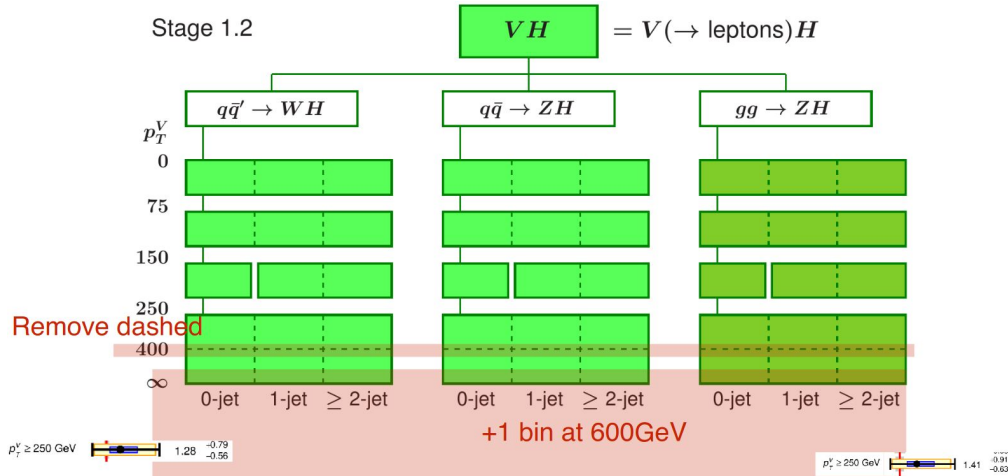
- Three high p_T bins: [250, 400), [400, 600), >= 600 GeV
- At a later stage, adding additional variables: $\Delta\varphi_{ll}$, m_T^{total}

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Expansion of existing predictions

- Extend the H p_T range of prediction: YR4 has up to 500 GeV

- Predictions in terms of additional jet activity: different jet sizes

- Double differential predictions: YR4 has H p_T for different V p_T,
  - aim for 2-D predictions of H p_T vs V p_T
  - try combination of other variables

- Studies on angular variables: effects of kinematic selections

- Final obvious update for fiducial cross sections: sqrt(s) = 13 → 14 TeV