Weekly update

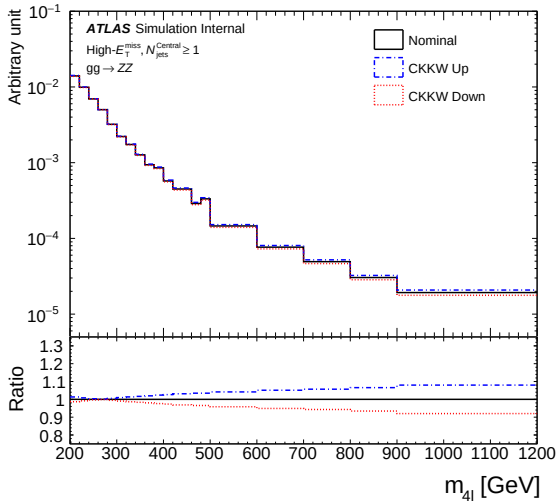
Abdualazem Fadol

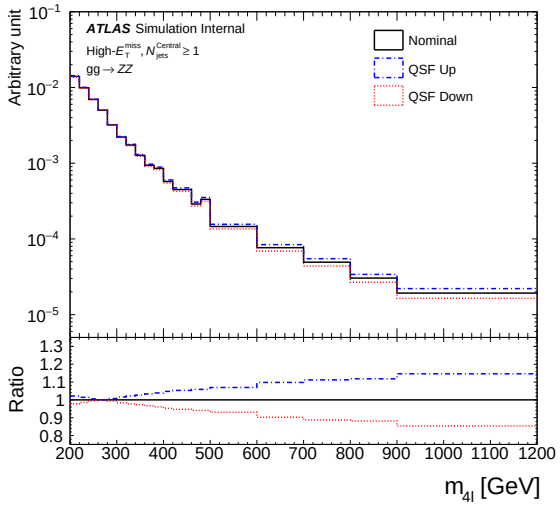
January 9, 2023

4l+MET analysis

Parton shower uncertainties for $gg \to ZZ$ sample

- The parton-shower uncertainty is evaluated by varying parameters in the parton-shower tunes such as CKKW and QSF settings, and by using different showering options.
- The systematic uncertainties are split into systematic effecting the shape and the normalisation.
- The shape systematic uncertainties:
  - CKKW: 2% to 8%
  - QSF: 2% to 8%
- The normalisation systematic uncertainties:
  - CKKW: 5.2%
  - QSF: 27%

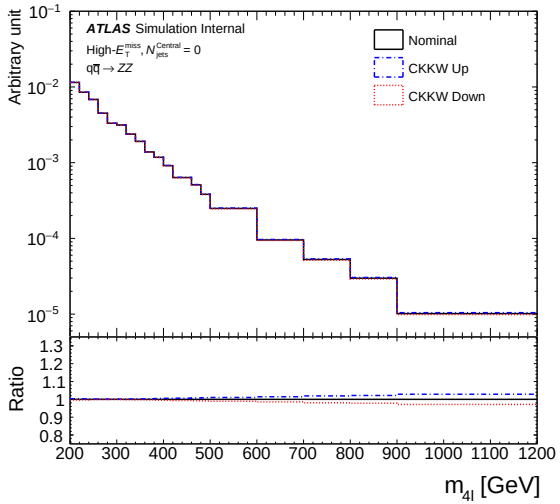


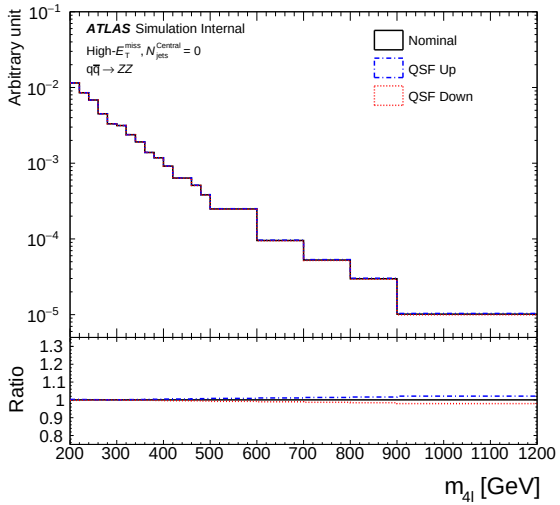


4l+MET analysis

Parton shower uncertainties for $q\bar{q} \to ZZ$ sample

- The parton-shower uncertainty is evaluated by varying parameters in the parton-shower tunes such as CKKW and QSF settings, and by using different showering options.
- The systematic uncertainties are split into systematic effecting the shape and the normalisation.
- The shape systematic uncertainties:
  - CKKW: 0.3% to 3%
  - QSF: 0.4% to 3%
- The normalisation systematic uncertainties:
  - CKKW: 2%
  - QSF: 3%





Things to finalise this week

- ☐ Fix the problem with the 4μ channel—This is the last item required for the unblinding.

  Table: Cut-flow for the raw events at the preselection for $(m_R, m_H) = (390, 220)$ GeV mass point. The events are shown for the $2e2\mu$, $2\mu2e$, $4e$ and 4μ channels using mc16a, mc16d and mc16e.

	$2e2\mu$	$2\mu2e$	$4e$	4μ
Total	140000.0	140000.0	140000.0	140000.0
Preselection	99342.0	99342.0	99342.0	99342.0
Trigger	98962.0	98962.0	98962.0	98962.0
Lepton	40806.0	40806.0	16176.0	25743.0
SFOS	19107.0	21279.0	15631.0	25616.0
Kinematics	19088.0	21261.0	15622.0	25592.0
TriggerMatch	19088.0	21261.0	15622.0	25592.0
Z1Mass & Z2Mass	18799.0	20999.0	20730.0	34571.0
DeltaR	18720.0	20871.0	20706.0	34325.0
Iso	16392.0	18877.0	18831.0	30096.0
D0Sig	16088.0	18549.0	18701.0	29365.0
Vertex	16059.0	18516.0	18660.0	29270.0
Final	16054.0	18477.0	13985.0	21859.0

- ☐ Finalise the validation plots for requesting new samples with large width approximation for A and H widths.
- ☐ Updating the note with the CKKW and QSF uncertainties and the fixed cutflow table.

Summary

- ☐ I finished all the to-do list that included into the note:

  To-do:

  - Estimating CKKW/QSF uncertainties for $q\bar{q} \rightarrow ZZ$ and $gg \rightarrow ZZ$ backgrounds (We need to generate samples at the truth level for this since the HZZ off-shell samples were deleted.)
  - Come up with an interpretation strategy for the $A \rightarrow ZH \rightarrow 4\ell + X$ model (one week)

- ☐ After a discussion with the conveners, we agreed to include 0.5% uncertainty on the trigger SF (global).
- ☐ I should be able to finalise the validation plots by the end of this week.
- ☐ And also discuss with the HZZ conveners about the problem with the cutflow table.