Higgs cross section measurements in the $H \to 4l$ decay channel in pp collisions at CMS

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The CMS detector

Datasets and triggers

Event Reconstruction

- Loose leptons:
  - Passing vertex cuts
  - Passing Rel. isolation cut to isolate the Z boson prompt leptons from EW decay ones
- Build possible ZZ candidates
- Choose the best ZZ candidates
- Other objects: FSR photons, Jets, MET

Background Estimation

- Irreducible: qqZZ, ggZZ (Simulation)
- Reducible: Z+X (data)

Kinematic Discriminants ($K_D$)

Use a complete set of mass and angular input observables

- Used in Categorization of events
- Used to extract signal in statistical analysis along with mass4l

Results: Simplified Template Cross Section (1.1)

Perform multidimensional maximum likelihood fit to $m_{4l} K_D$ templates

$$L_{2D}(m_{4l}, K_D) = L(m_{4l}) L(K_D)$$

Overall signal strength uncertainty: 10%

Systematic Uncertainties

Main Experimental Sources: Lepton efficiencies, Signal and background
Main Theoretical Sources: ggH QCD and PDF set, Branching Ratio

Conclusion

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References