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Combination of Higgs to Invisible Channels

Introduction

- Decays of the Higgs boson to invisible final states are a strong indication of BSM physics
  - SUSY, graviscalars, etc.
- Because the final state is invisible the search must be carried out in the associated production channels:
  - Look for large missing transverse energy plus associated production
- All following results are limits on the invisible branching fraction of a 125 GeV Higgs boson.

Analyses

- There are two currently approved CMS analyses searching for invisible final states of the Higgs boson.
  - HIG-13-013, VBF production, sees an observed (expected) limit of 69% (53%) at 95% C.L.
  - HIG-13-018, ZH channel, sees an observed (expected) limit of 75% (91%) at 95% C.L.
- A further analysis, HIG-13-028, in the ZH$\rightarrow$bb+invisible channel is in progress
- The CMS indirect limit, from visible channels, is 64%
- Both approved analyses have uploaded their datacards to the combinations SVN.

Combination Method

- Using the standard Higgs combination tool I combined the cards for the two approved analyses
- The luminosity uncertainties were considered correlated between the analyses
- All other uncertainties were considered not to be correlated between analyses
  - VBF analysis datacard does not separate out individual sources of error so JES/R correlations cannot be taken into account without more information

Results

- The expected limit is found to be: 46%
- The 68% C.L. band on the expected limit is 34-62%
- The observed limit is 53%
- Compatible with the SM
- Strongest limit so far on invisible branching fraction of the Higgs boson.

Backup

ATLAS results

- Indirect limit 60%
- ZH 65% observed for 84% expected