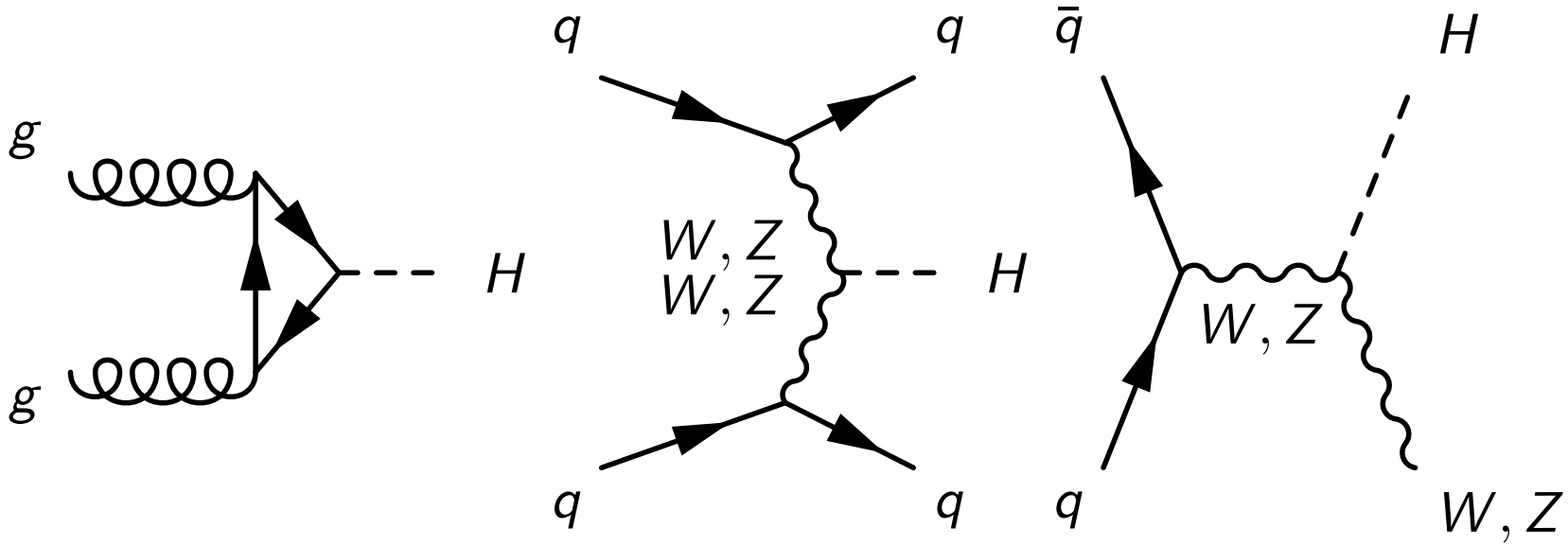
Imperial College London

Latest results on invisibly decaying Higgs bosons

Patrick Dunne - Imperial College London
on behalf of the ATLAS and CMS Collaborations
DM@LHC 2016 - 31/03/2016



Outline

- How to search for invisibly decaying Higgs bosons:
  - direct and indirect searches
- Run 1 results from ATLAS and CMS
- Run 2 results from CMS
- Projections of future sensitivity

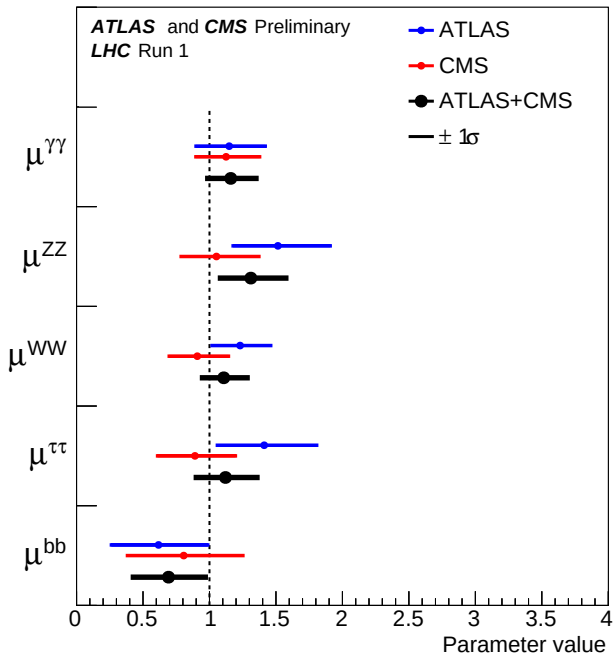
Why look for invisibly decaying Higgs bosons?

Theoretical Motivations

- All SM massive particles get their mass through Higgs boson couplings
- Why not dark matter?

Experimental motivation

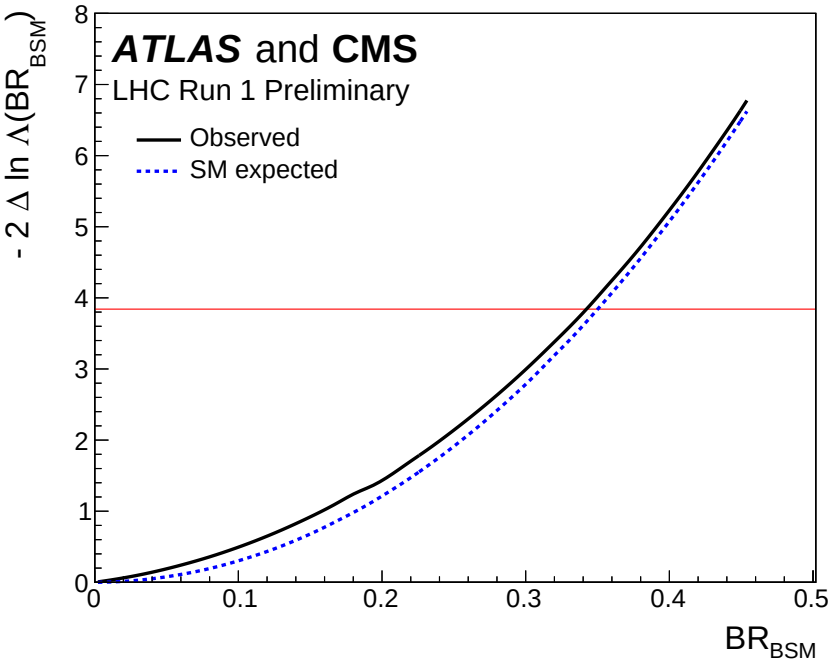
- Measurements of the Higgs boson made so far are impressive:
  - Mass measured with 0.2% error
- A lot of parameters are still relatively unconstrained:
  - Limit on width is $\sim 4\Gamma_{SM}$
- Plenty of room for Higgs boson couplings to dark matter



How to search for invisibly decaying Higgs bosons

Indirect searches

- Compare visible width to total width:
  - $\mathrm{BR_{BSM}} = \frac{\Gamma_H - \Gamma_{vis}}{\Gamma_H}$
- No measurement of Γ_H, need to make an assumption
  - Usually assume SM width
- ATLAS+CMS combination gives an observed (expected) limit on $\mathrm{BR_{BSM}}$ of 0.34 (0.35) at 95% CL



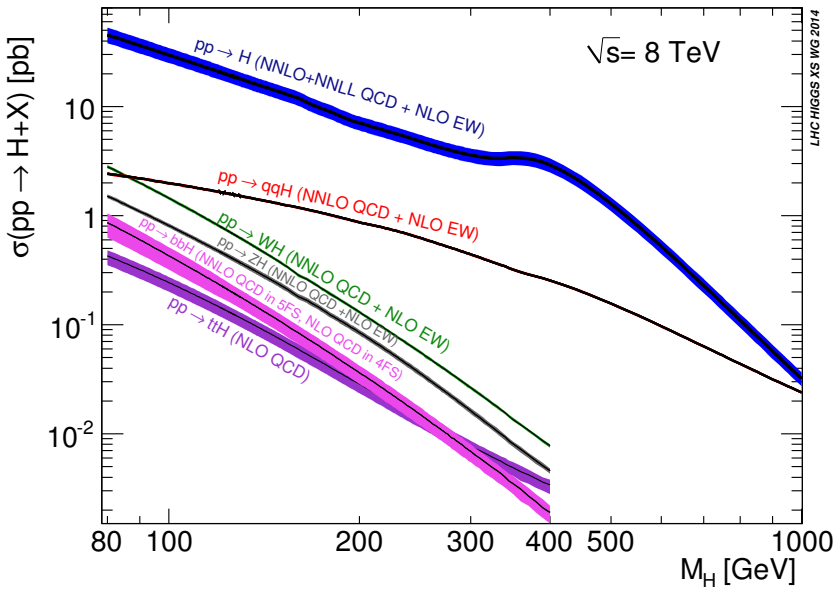
CMS-PAS-HIG-15-002
ATLAS-CONF-2015-044

How to search for invisibly decaying Higgs bosons

- Look for associated Higgs boson products plus E_T^{miss}

Production channels

- Gluon fusion needs ISR
  - High rate but difficult final state
- VBF
  -
- VH
  -



Run 1 ATLAS direct searches - ZH

Run 1 ATLAS direct searches - V(had)H

Run 1 ATLAS direct searches - VBF

Run 1 ATLAS direct searches - Combination

Run 1 CMS direct searches - ZH

Run 1 CMS direct searches - Monojet

Run 1 CMS direct searches - VBF

Run 1 CMS direct searches - Combination

Run 2 CMS direct searches - ZH

Run 2 CMS direct searches - VBF

Run 2 CMS direct searches - Combination

CMS projections and interpretations

Summary

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