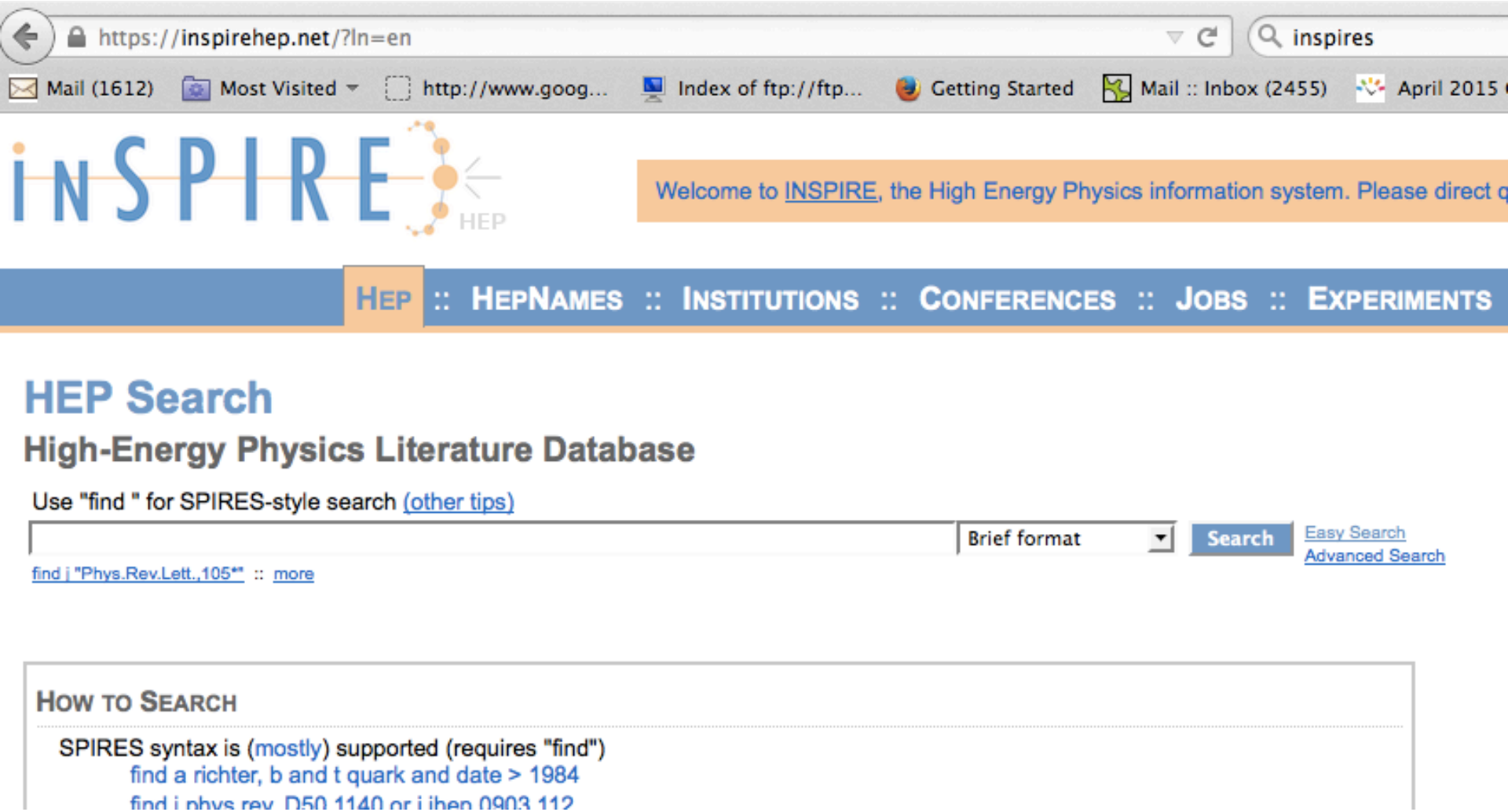
https://inspirehep.net/?ln=en
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Mail (1612)
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April 2015
iNSPIRE HEP
Welcome to INSPIRE, the High Energy Physics information system. Please direct q
HEP :: HEPNAMES :: INSTITUTIONS :: CONFERENCES :: JOBS :: EXPERIMENTS
HEP Search
High-Energy Physics Literature Database
Use "find " for SPIRES-style search (other tips)
Brief format
Search
Easy Search
Advanced Search
find j "Phys.Rev.Lett.,105*" :: more
HOW TO SEARCH
SPIRES syntax is (mostly) supported (requires "find")
find a richter, b and t quark and date > 1984
find j phys rev D50 1140 or j jhep 0903 112

higgs | Brief format | Search

find j "Phys.Rev.Lett.,105**" :: more

Sort by: earliest date | desc. | times cited

Display results: 25 results | single list

8. **Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC**

(4244) ATLAS Collaboration (Georges Aad (Freiburg U.) *et al.*). Jul 2012. 24 pp.
Published in **Phys.Lett. B716 (2012) 1-29**
CERN-PH-EP-2012-218
DOI: 10.1016/j.physletb.2012.08.020
e-Print: **arXiv:1207.7214 [hep-ex]** | **PDF**

References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
CERN Document Server ; ADS Abstract Service; Link to all figures including auxiliary figures; Interactions.org article

Detailed record - Cited by 4244 records 1000+

9. **Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC**

(4166) CMS Collaboration (Serguei Chatrchyan (Yerevan Phys. Inst.) *et al.*). Jul 2012. 42 pp.
Published in **Phys.Lett. B716 (2012) 30-61**
CMS-HIG-12-028, CERN-PH-EP-2012-220
DOI: 10.1016/j.physletb.2012.08.021
e-Print: **arXiv:1207.7235 [hep-ex]** | **PDF**

References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
CERN Document Server ; ADS Abstract Service; Link to PRESSRELEASE; Interactions.org article

Detailed record - Cited by 4166 records 1000+

higgs | Brief format | Search

find j "Phys.Rev.Lett.,105*" :: more

Sort by: earliest date | desc. | times cited

Display results: 25 results | single list

16. **Broken Symmetries and the Masses of Gauge Bosons**

(3153) Peter W. Higgs (Edinburgh U.). Oct 1964. 2 pp.
Published in **Phys.Rev.Lett. 13 (1964) 508-509**
DOI: 10.1103/PhysRevLett.13.508

References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
CERN Document Server ; ADS Abstract Service; Phys. Rev. Lett. Server

Detailed record - Cited by 3153 records 1000+

17. **Broken symmetries, massless particles and gauge fields**

(3085) Peter W. Higgs (Edinburgh U.). Sep 1964. 2 pp.
Published in **Phys.Lett. 12 (1964) 132-133**
DOI: 10.1016/0031-9163(64)91136-9

References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
CERN Document Server ; ADS Abstract Service

Detailed record - Cited by 3085 records 1000+

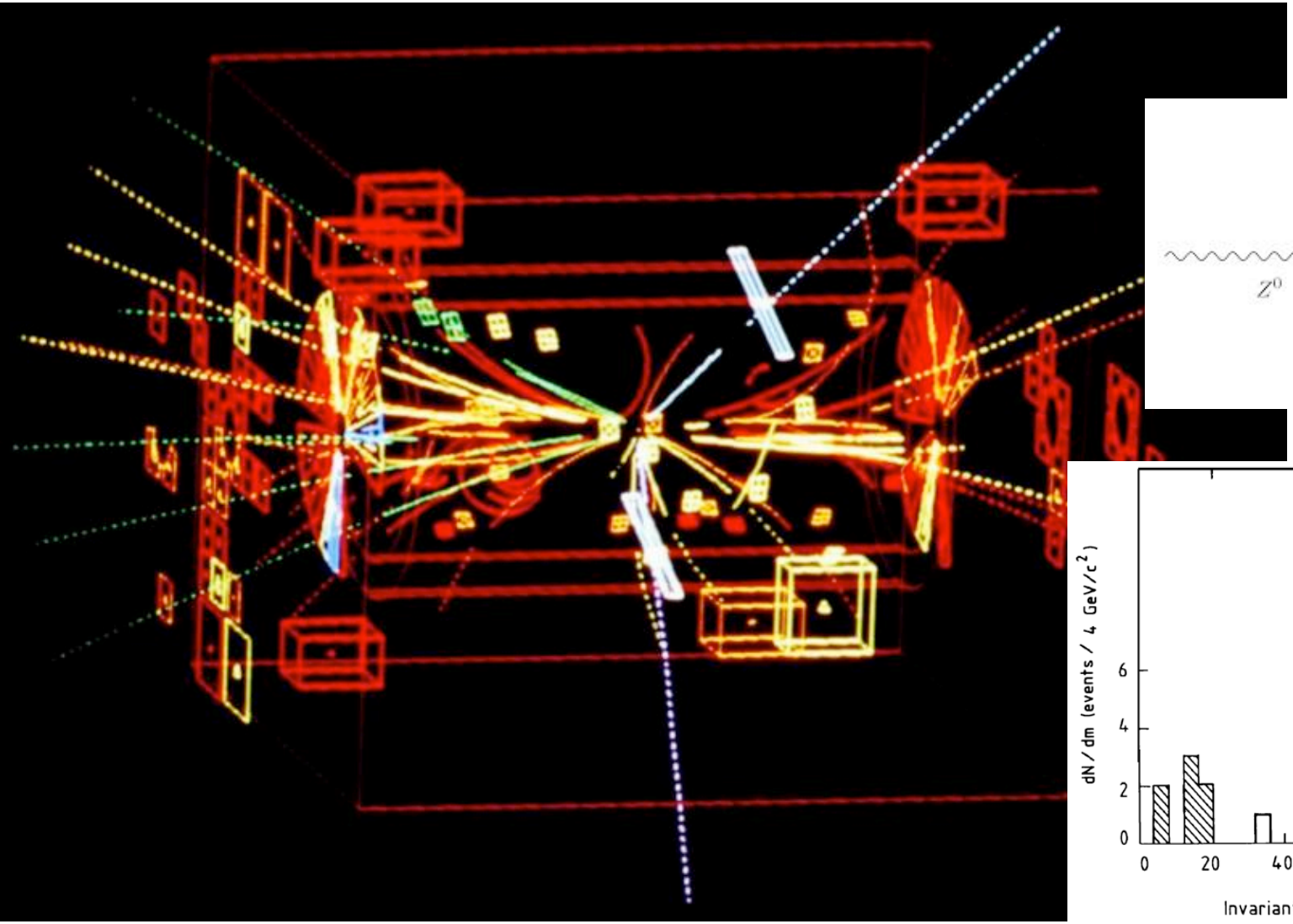
HW for next week May 5^{th} :

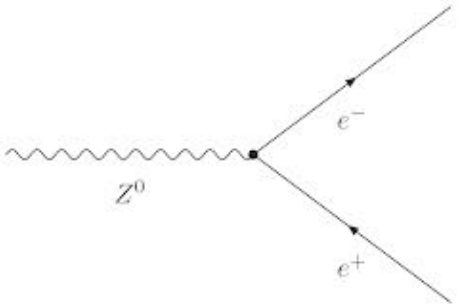
Read papers and answer questions:

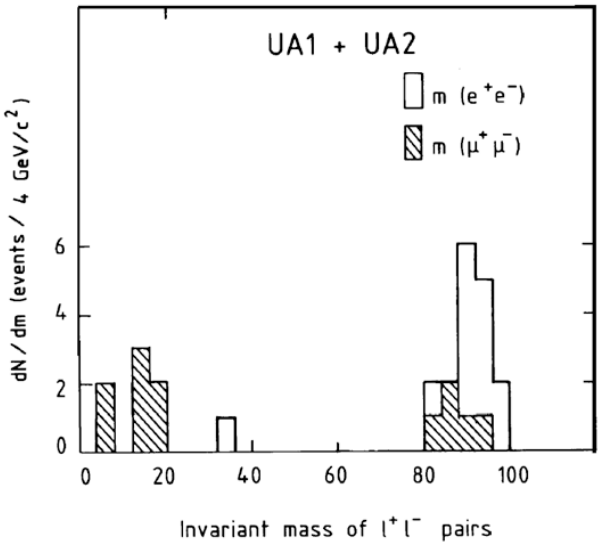
Why is the Higgs particle important
What are the particle properties?
How is the Higgs measured ?
decay, detectors,…

Z Boson at UA1 experiment CERN SPS 1983

270 GeV proton+antiproton

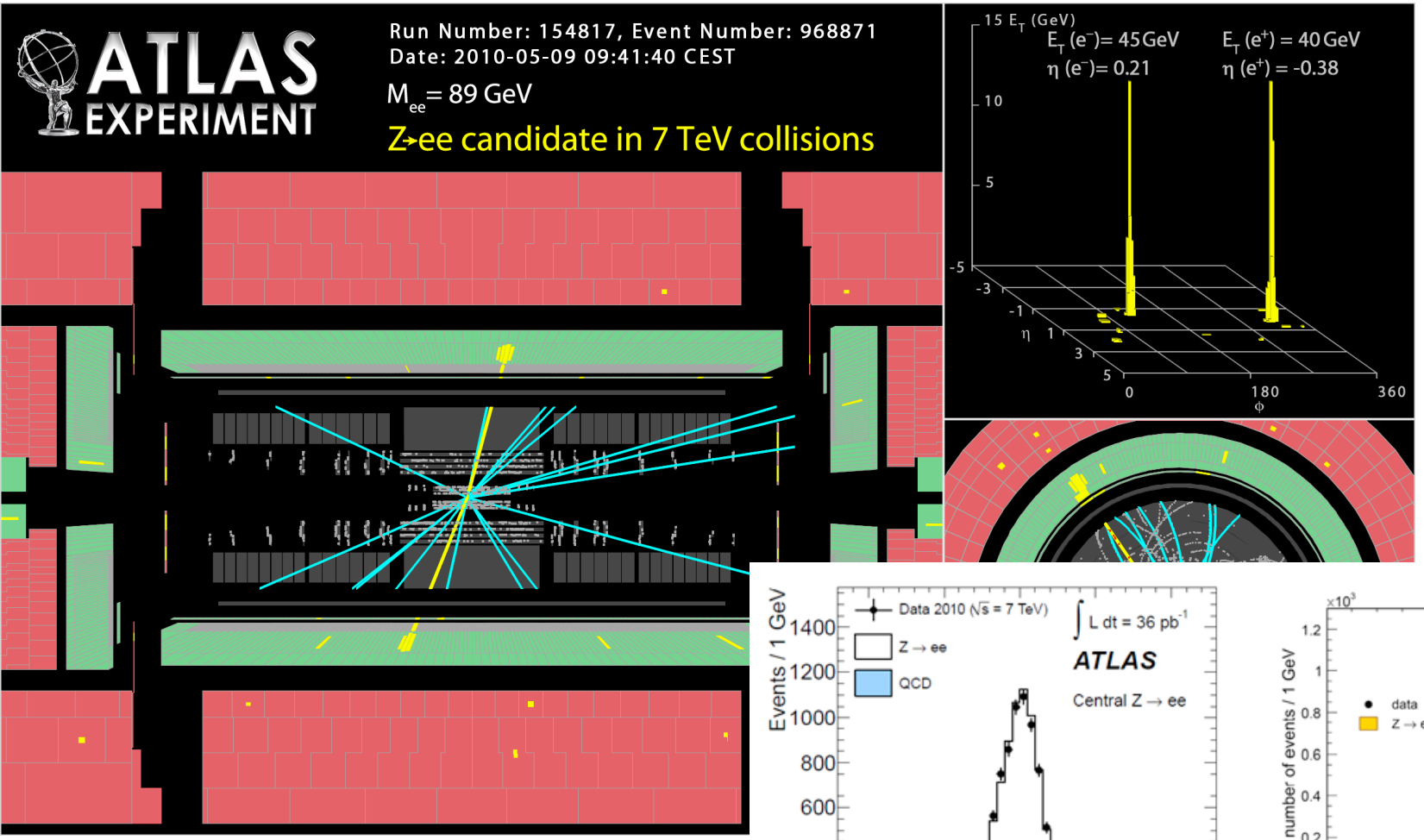


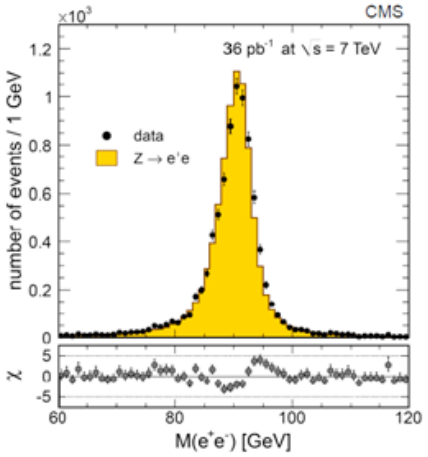




Z Boson at ATLAS experiment CERN LHC

270 GeV proton+antiproton





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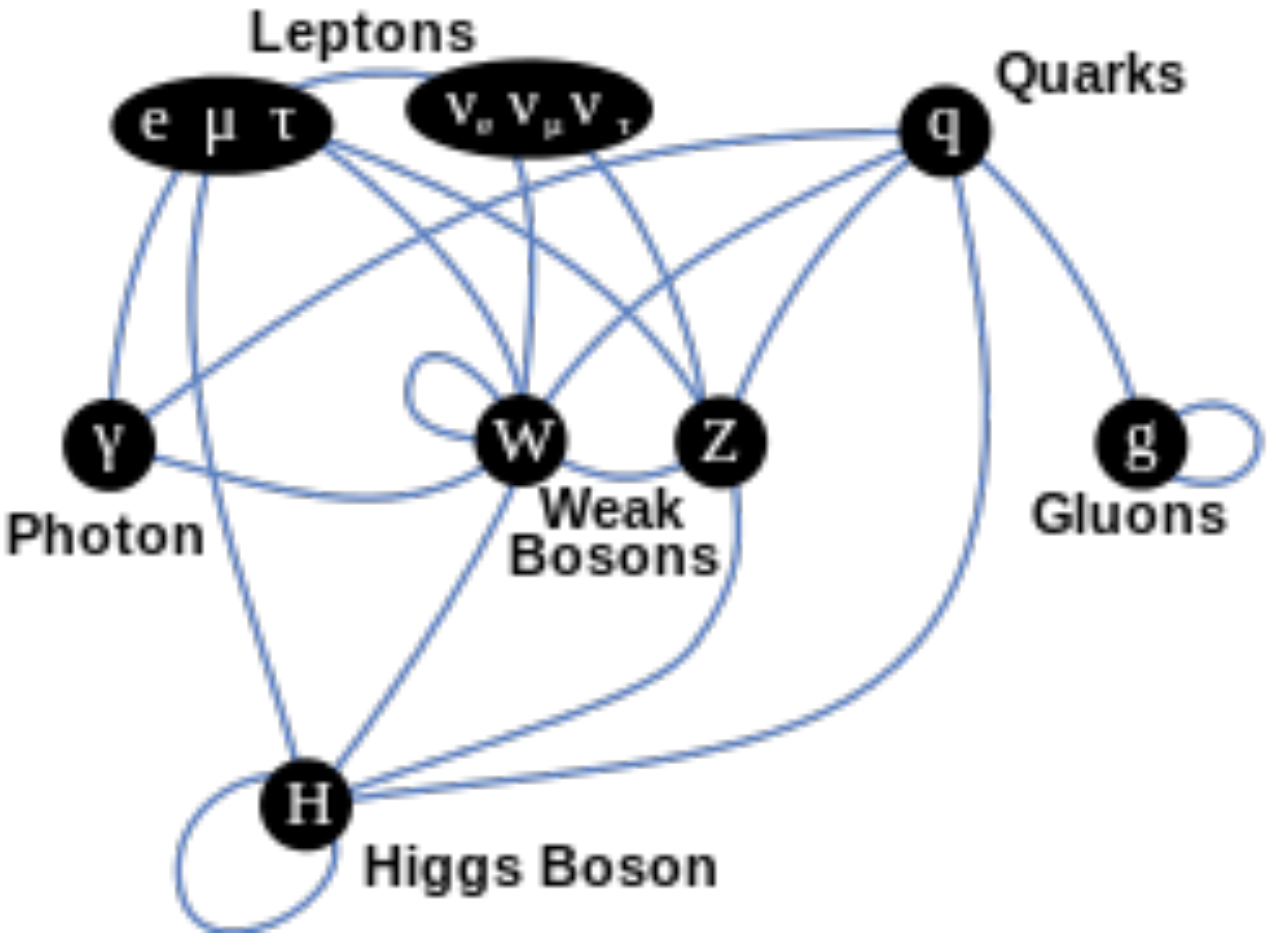
How is the Higgs measured ?
decay, detectors,…

Higgs Boson


Leptons
e μ τ
$\nu_e \nu_\mu \nu_\tau$
Quarks
q
γ
Photon
W
Z
Weak Bosons
g
Gluons
H
Higgs Boson

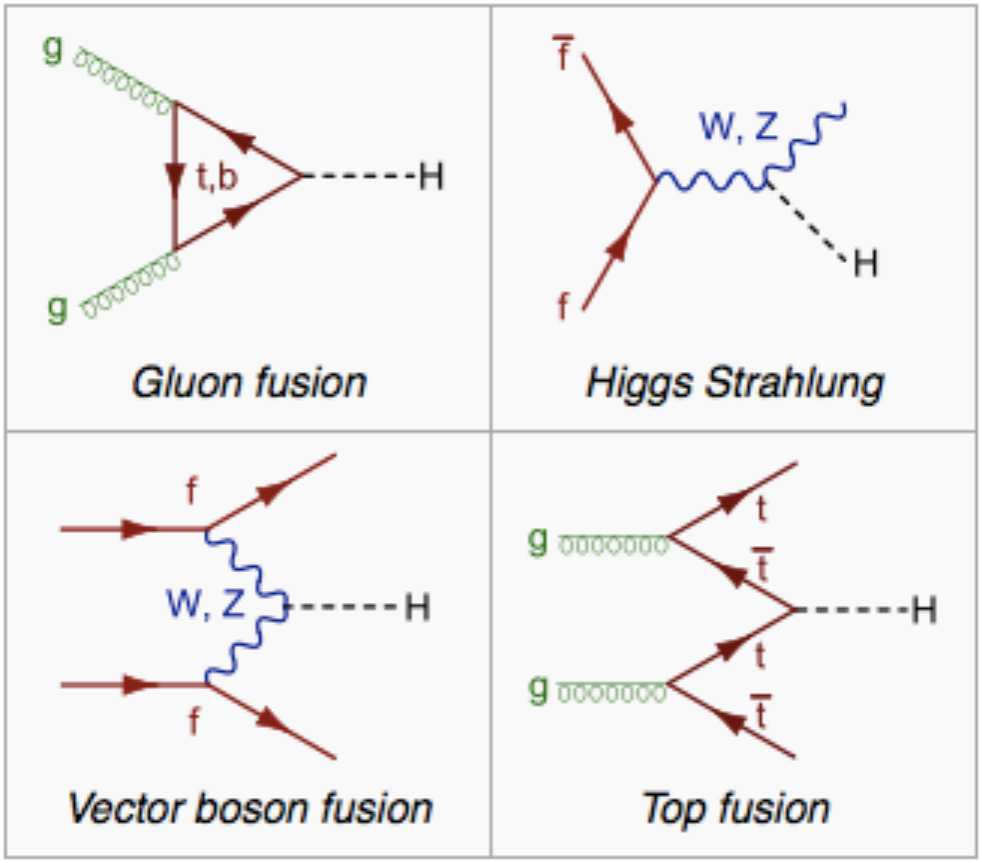
Higgs Production

two gluons combine to form a loop of virtual quarks. Since the coupling of particles to the Higgs boson is proportional to their mass, this process is more likely for heavy particles.

f = fermion (spin ½)

Feynman diagrams for Higgs production

p+p (LHC)



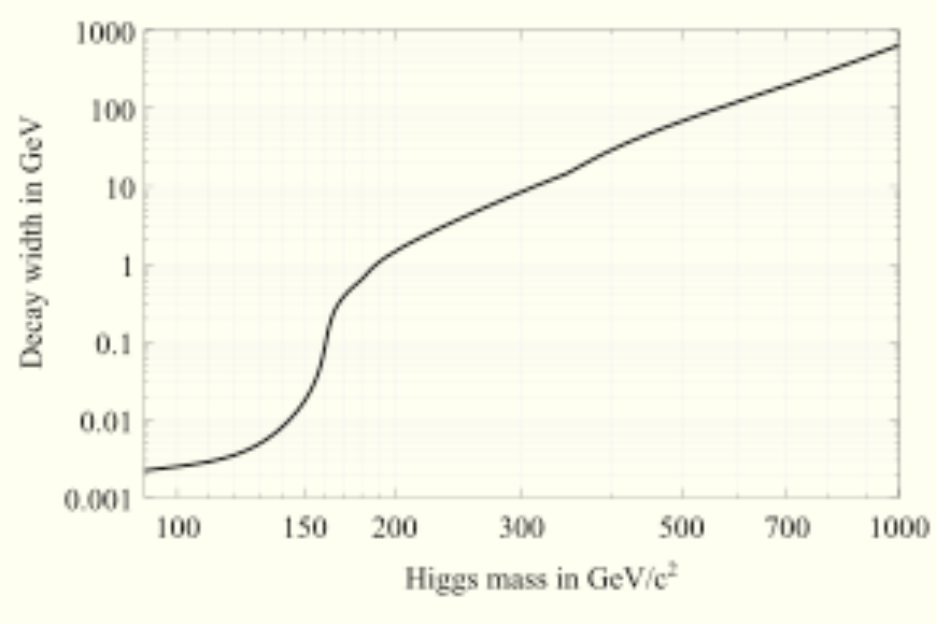
quark with an anti-quark or an electron with a positron (LHC only 3th largest process)

two (anti-)fermions collide (LHC second most important process)

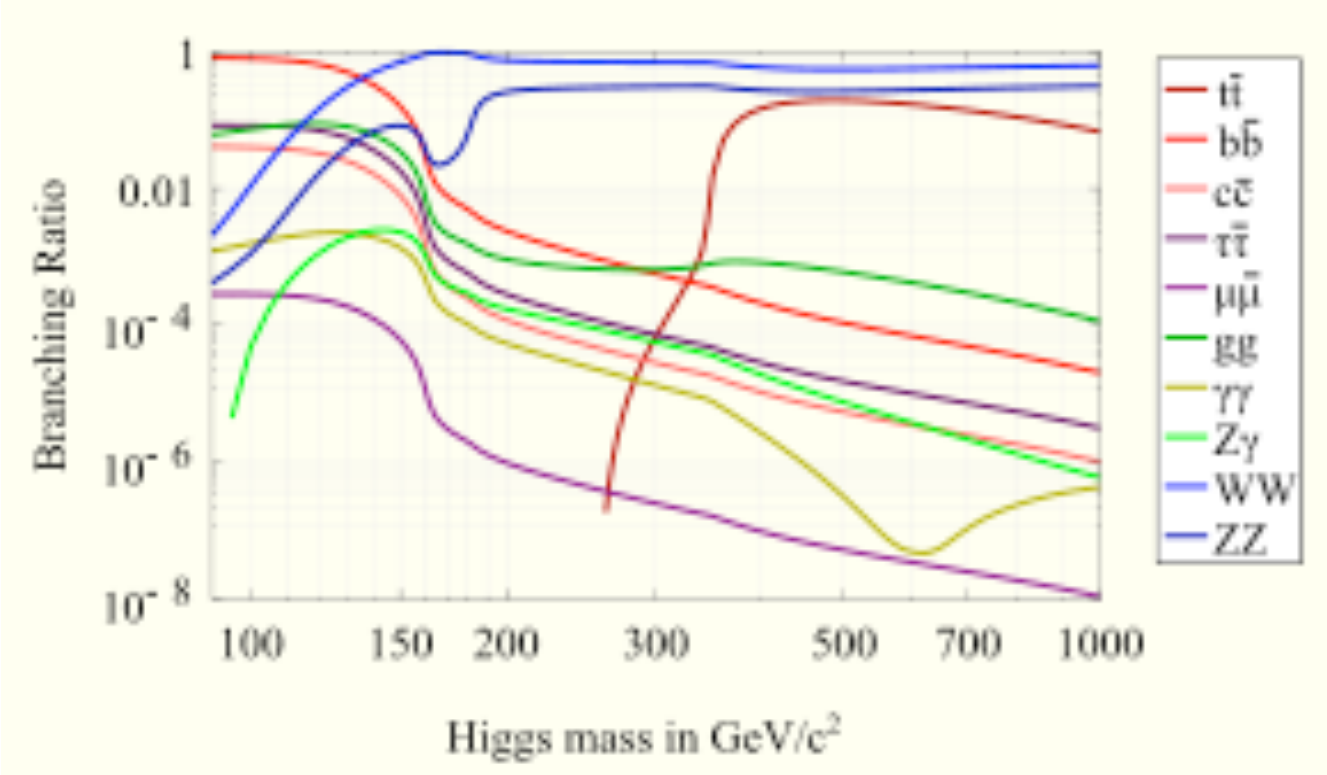
by far the least likely (by two orders of magnitude)

Higgs Decay

Quantum mechanics predicts that if it is possible for a particle to decay into a set of lighter particles, then it will eventually do so. [92] This is also true for the Higgs boson. The likelihood with which this happens depends on a variety of factors including: the difference in mass, the strength of the interactions, etc. Most of these factors are fixed by the Standard Model, except for the mass of the Higgs boson itself. For a Higgs boson with a mass of 126 GeV/c2 the SM predicts a mean life time of about 1.6×10−22 s.

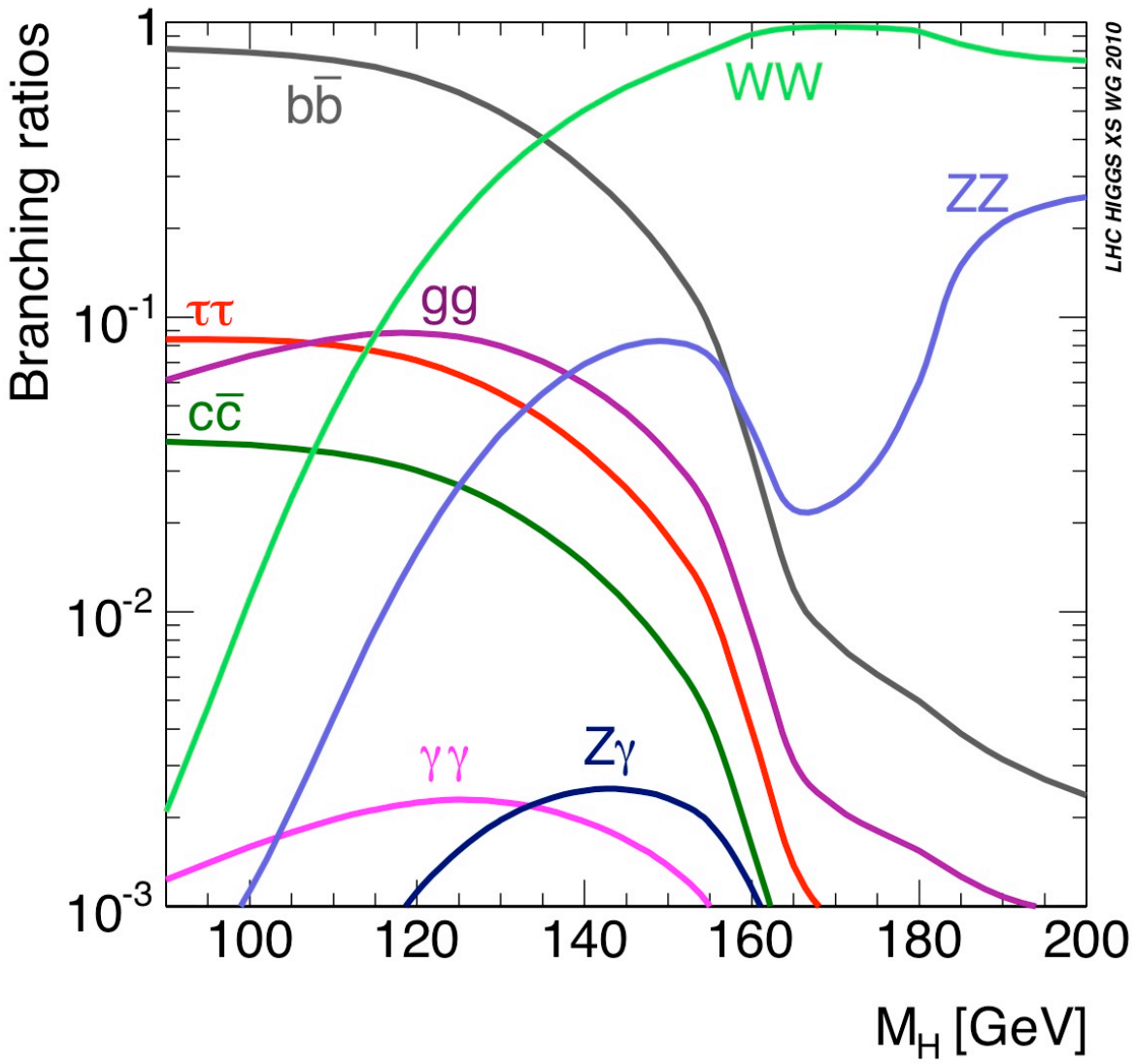


Branching ratio

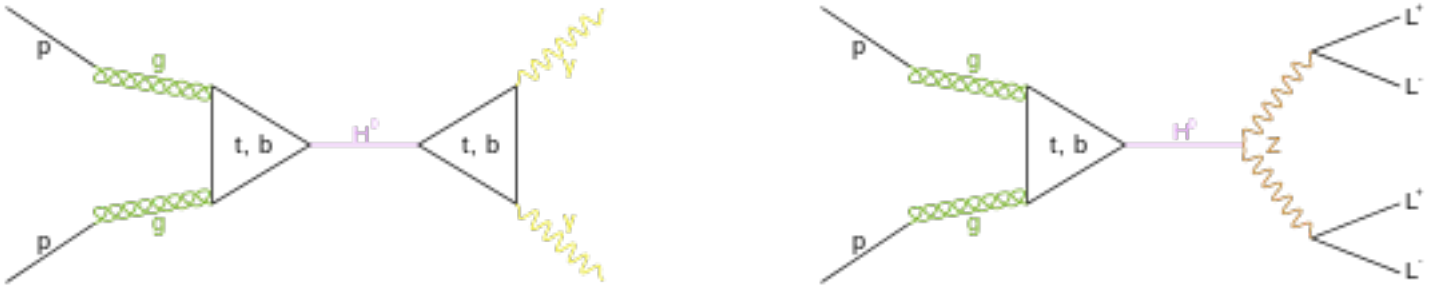


Since it interacts with all the massive elementary particles of the SM, the Higgs boson has many different processes through which it can decay. Each of these possible processes has its own probability, expressed as the branching ratio; the fraction of the total number decays that follows that process. The SM predicts these branching ratios as a function of the Higgs mass

Branching Ration of Higgs Decays



Discovery at CERN

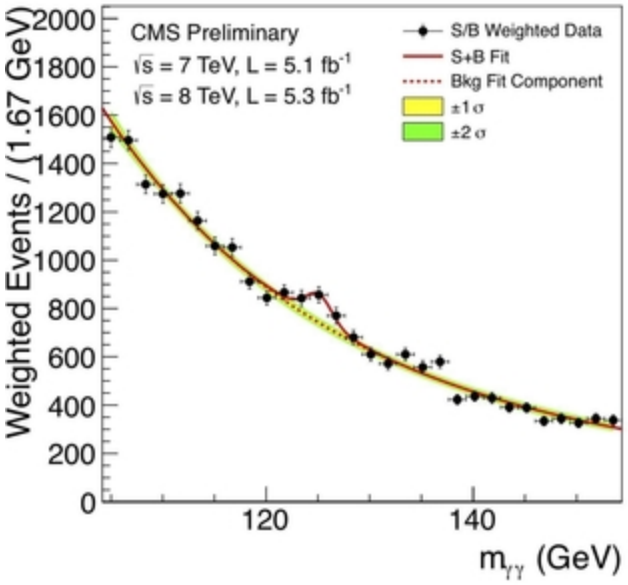


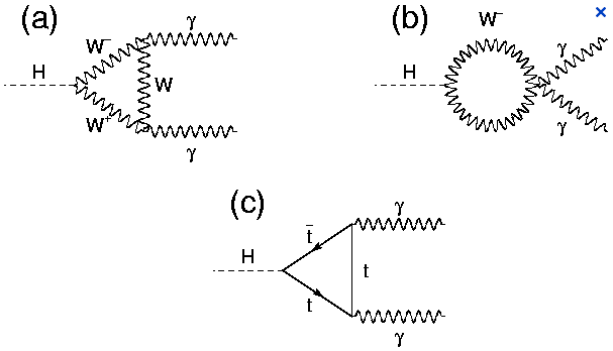
eft: Diphoton channel: Boson subsequently decays into 2 gamma ray photons by virtual interaction with a W boson loop or top quark loop.

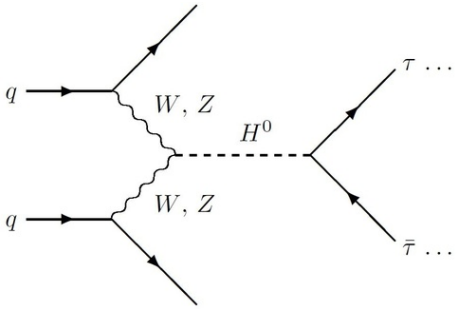
Right: 4-Lepton "golden channel": Boson emits 2 Z bosons, which each decay into 2 leptons (electrons, muons).

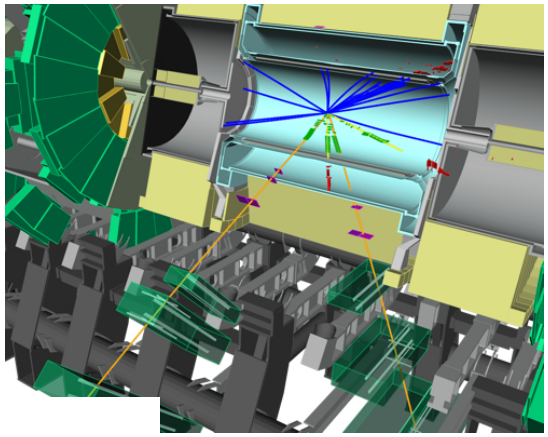
Experimental analysis of these channels reached a significance of more than 5 sigma in both experiments

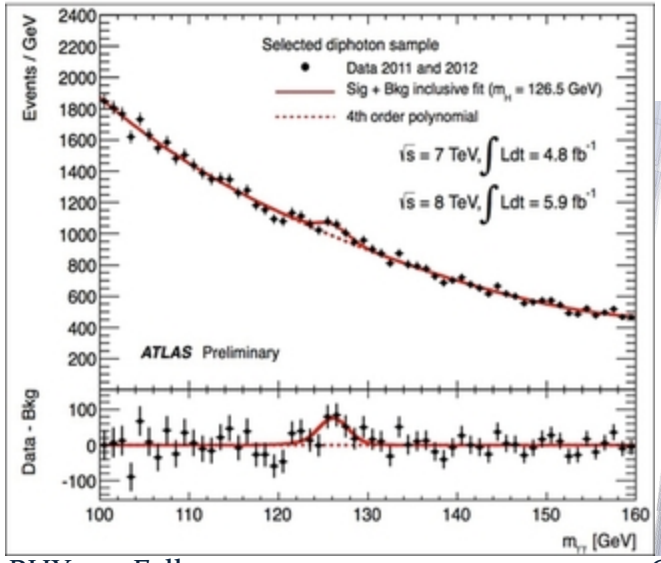
The Higgs

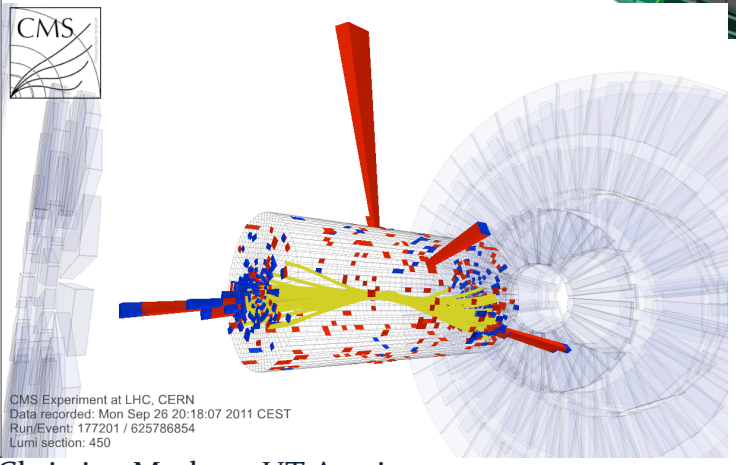

CMS Preliminary
√s = 7 TeV, L = 5.1 fb-1
√s = 8 TeV, L = 5.3 fb-1
S/B Weighted Data
S+B Fit
Bkg Fit Component
±1σ
±2σ
Weighted Events / (1.67 GeV)
mγγ (GeV)


(a)
(b)
(c)
H
W
γ
t


q
W, Z
H0
τ ...
τ̄ ...




Selected diphoton sample
Data 2011 and 2012
Sig + Bkg inclusive fit (mH = 126.5 GeV)
4th order polynomial
√s = 7 TeV, ∫Ldt = 4.8 fb-1
√s = 8 TeV, ∫Ldt = 5.9 fb-1
ATLAS Preliminary
Events / GeV
Data - Bkg
mγγ [GeV]


CMS
CMS Experiment at LHC, CERN
Data recorded: Mon Sep 26 20:18:07 2011 CEST
Run/Event: 177201 / 625786854
Lumi section: 450