Particle Physics FYS4560

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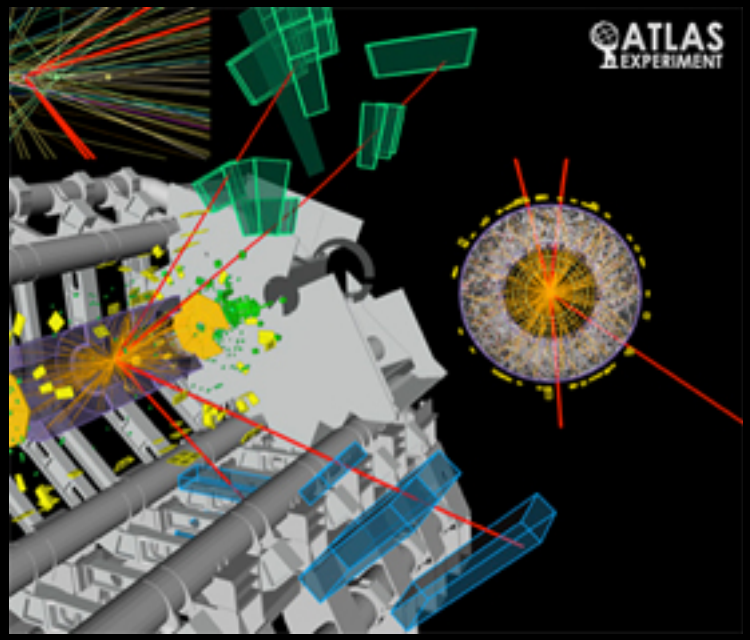
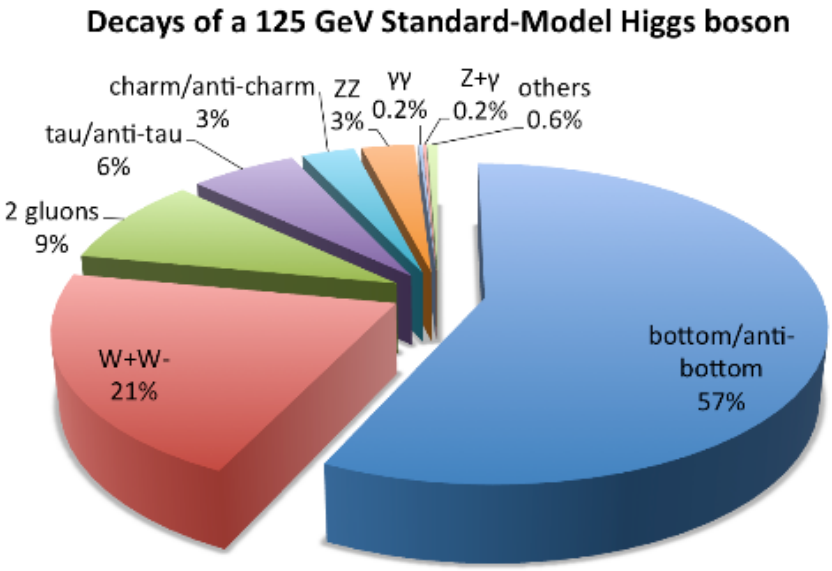


Project 3
Hands-on-Higgs

To be delivered 30. April 2016

Higgs production and decay

1. Calculate the width and branching ratio the SM Higgs decay to fermion anti-fermions and cross check with CompHEP
   1. Plot the branching ratio as function of the Higgs mass
   2. Discuss the decays into 2 gauge bosons – it is not required to do detailed calculations here



2. How is the Higgs boson produced at LHC?
   1. Feynman graphs and a summary plot of cross sections as a function of energy
   2. When possible add the cross sections obtained at 8 and 13 TeV with CompHEP .
   3. Discuss in particular the 125 GeV Higgs boson observed by ATLAS and CMS. Production and decays

Higgs properties & future prospects

3. Cover one of the 2 questions:
   1. Calculate the width of a "heavy-enough" SM Higgs boson decaying to a pair of real ZZ and WW weak bosons.
   2. Explain how ATLAS has measured the spin of the Higgs. What about parity and charge conjugation?

4. Future important studies at a 500 GeV e+e- collider
   1. Discuss briefly the Higgs program at such a facility, with emphasis on 2 of the most important measurements.
   2. Study one of the following 2 processes (ideally shared between yourselves): production, signatures, signal vs SM background. *No need for calculations here, CompHEP is enough.*
      1. e+e- → ZH
      2. e+e- → ttbar H