

# LAPP to-do list and tools for Higgs boson analysis



Laboratoire d'Annecy-le-Vieux  
de Physique des Particules



©Lison Bernet



25<sup>th</sup> of March 2013



# Common to both analyses (1)

---

- ◆  $N_{\text{signal}}$  extraction from S+B fit
  - include systematics in the datacard?
  
- ◆ Systematic uncertainties on  $C_H$  factors
  - so far, inclusive only (main analysis)
  - $m_H$  dependent uncertainties (especially very high mass) ?
  - $p_T^{\gamma\gamma}$  dependent uncertainties?
  - photon identification, energy scale, and isolation
  - mass resolution



# Common to both analyses (2)

## ◆ Background modelling

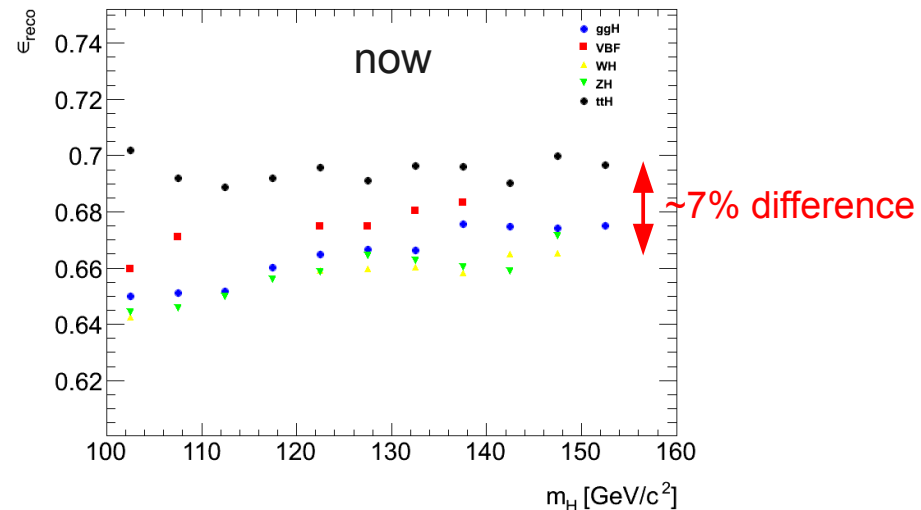
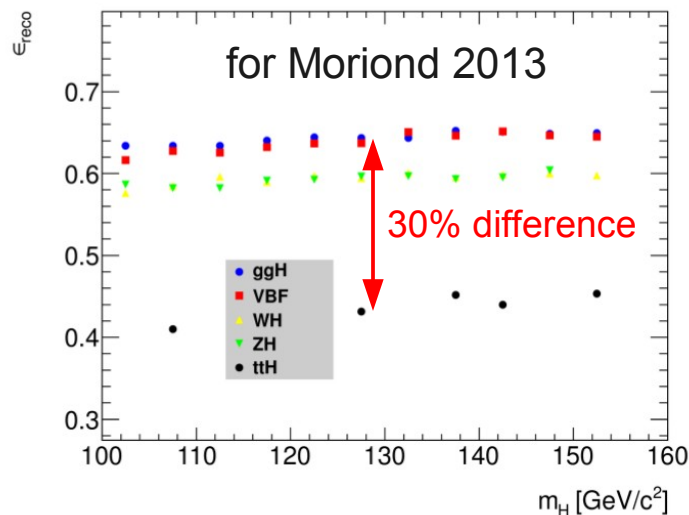
- Sherpa + Pythia samples ( $\gamma\gamma + \gamma j + jj$ ) from Wisconsin
- produce own samples (Diphox?) for high masses?
- interim solution: data-driven à la CMS?

*Marco ?*

## ◆ $C_H$ factors independent from process

- almost done
- associated systematics? (isolation)

*Jessica*





# Limit on fiducial cross-section

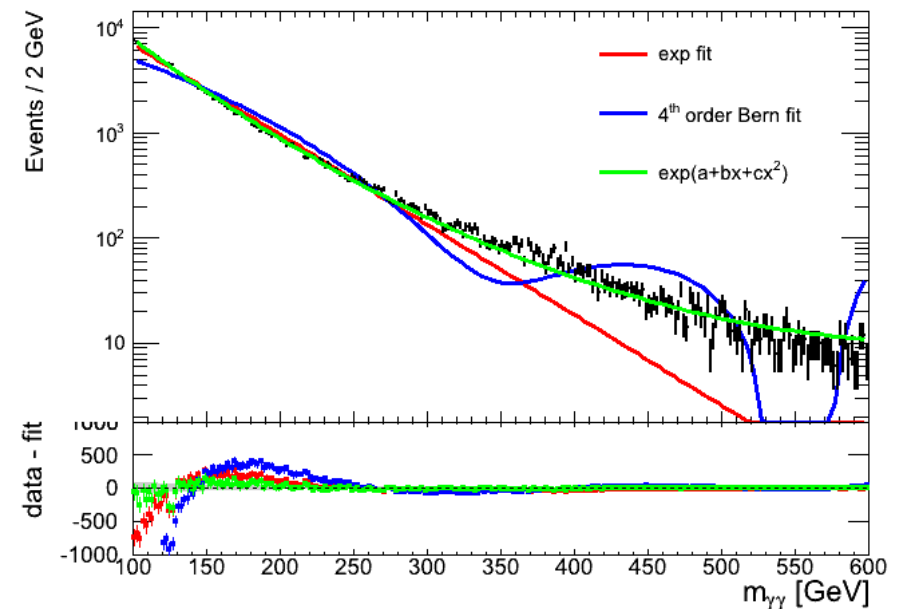
## ◆ Signal parametrisation

- with mass dependence
- wait for MC production? Produce unofficial graviton samples?

*Elisabeth*

## ◆ Background parametrisation

- hard to find single function
- split analysis in  $m_{\gamma\gamma}$  ranges?
- window fit around tested mass point?

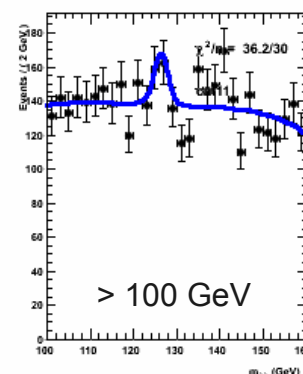
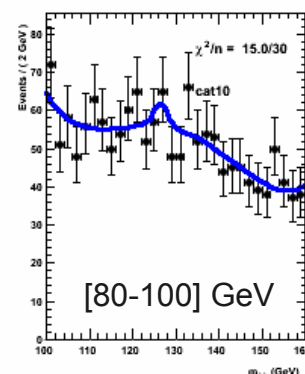
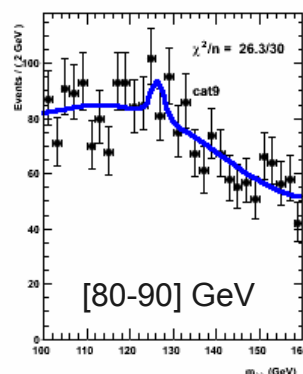
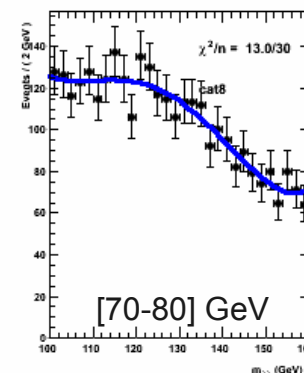
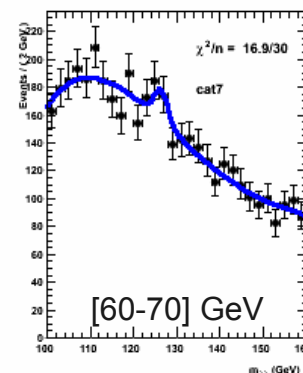
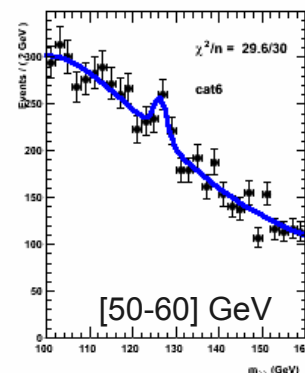
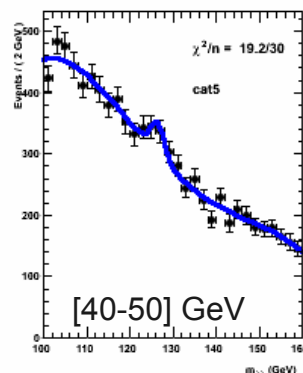
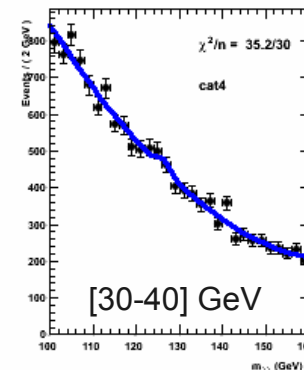
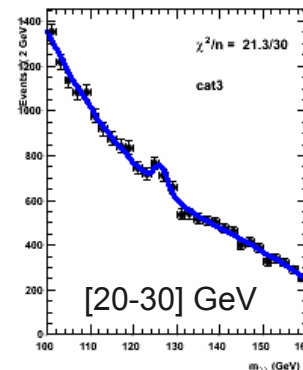
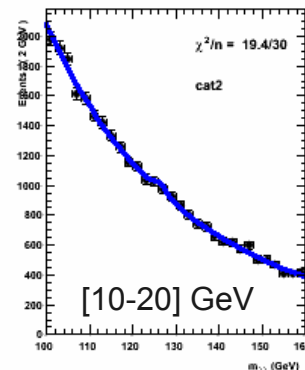
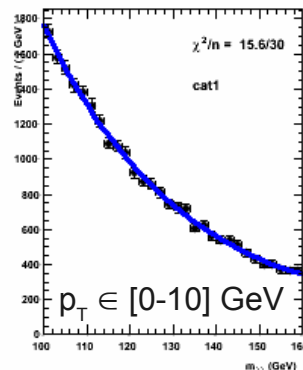




# Differential cross section

*Luzana ?*

- ◆ Signal modelling
  - at 125 GeV only
- ◆ Background modelling
  - $p_T^{YY}$ - $m_{YY}$  correlation
- ◆ Migration between  $p_T$  bins
  - use of HqT
- ◆ Unfolding?





# Tools

---

- ◆ HGGReader: produce private ntuples from photon D3PDs on eos (ie on lxplus)
  - (should be) in agreement with official cut-flow
  - options to remove myy mass cut, isolation, etc
  - ~2-3h for all 2012 dataset + MC samples in batch mode
  
- ◆ Hfitter
  - to compute limits, p0, fit with categories, etc
  - many datacards available
  - based on RooFit
  
- ◆ Installation, use, examples here:  
<https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/Hfitter>



# Home-made ntuples

---

- ◆ Fresh from the oven
- ◆ Data+MC ntuples with all selections applied:  
`/afs/cern.ch/work/n/nberger/public/Tuples/Moriond2013`
- ◆ Data+MC ntuples with preselection only (trigger, quality cuts and photon pT, eta and loose ID)  
`afs/cern.ch/work/n/nberger/public/Tuples/Moriond2013_Presel`
- ◆ MC ntuples with no selection applied:  
`/afs/cern.ch/work/n/nberger/public/Tuples/Moriond2013_AllEvents`

Back-up slides