

H- \rightarrow bb Status



Ricardo Gonalo (RHUL)
on behalf of the H- \rightarrow bb analysis team

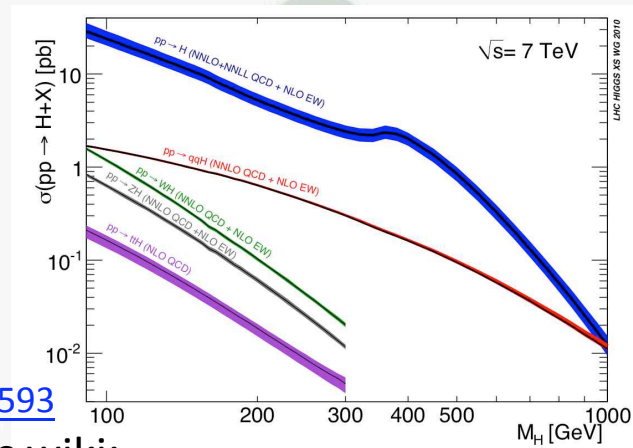
HSG5 Meeting, 16 February 2011

H->bb at a glance

- **WH and ZH** analyses progressing in parallel – concentrating on **non-boosted** for now
 - Birmingham/Liverpool, Wisconsin, LMU Munich, Lisbon, Carleton, Argonne, Glasgow and Royal Holloway
- **Boosted WH/ZH** to follow – more relevant at higher lumi but **essential for this year**
 - Activity in UCL London at the moment – commission jet substructure observables
 - **Manpower badly needed here** – volunteers welcome!
- **tH** analysis progressing – developing multivariate analysis
 - Glasgow involved, Edinburgh just joined... a Scottish Higgs channel!
- **VBF H->bb** – activity from Victoria
 - Rough estimate: sensitivity between hh and ll channels of VBF H-> $\tau\tau$ (no trigger, 30fb^{-1})
 - Trigger is crucial in this analysis – currently working on this, in contact with jet trigger
- **SUSY H->bb** – activity in Freiburg within the SUSY working group
 - See ATL-COM-PHYS-2011-030 – Atlfast II study
 - Challenging: no discovery at $\sqrt{s} = 10 \text{ TeV}$, 10fb^{-1}
 - Becomes quite interesting for $\sqrt{s} = 14 \text{ TeV}$, 30pb^{-1} , at $m_0 \approx 500\text{GeV}$, $m_{1/2} \approx 350\text{GeV}$ (mSUGRA)
 - Trigger is crucial in this analysis – ongoing work

LHC Higgs Cross Section Working Group

- LHC Higgs Cross Section Group:
<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/CrossSections>
- **Yellow report** with inclusive cross sections:
 - **Yellow report recently** released: <http://arxiv.org/abs/1101.0593>
 - Higgs WG requested to use numbers from the LHC xsec wiki:
<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/CERNYellowReportPageAt7TeV>
- Second phase of work starting now: **exclusive Higgs observables**
 - Higgs Signal: cross sections with cuts, differential K-factors, effect of jet-veto or b-tag jet on differential K-factors, comparison between NLO MC and NNLO codes
 - SM Backgrounds: define control regions, estimate theoretical errors, use the most advanced NLO MC (POWHEG, MC@NLO, new Sherpa), signal/background interference
 - Theory Uncertainties: for exclusive observables, for both SM and MSSM Higgs, QCD scale and PDF error correlations among different Higgs production channels and among
- First results expected for BNL workshop in May; plan for 2 publications this year
- **H→bb meeting** on 17 February 2011:
 - Survey of the codes (for both VH→Vbb and ttH), loose (i.e. non-boosted) VH analysis
 - Will start with validation on Wbb calculations
 - **Volunteers welcome!**



WH/ZH Status & Plans

- Cut-flow tables being compared by most active analyses:
<https://twiki.cern.ch/twiki/bin/view/AtlasProtected/WHNoteSummer2011>
 - Comparison in release 15 down to 5% agreement between different groups
 - Served to get analyses debugged and running
 - On-going comparison with release 16 – results expected in next week's meeting
- Following steps:
 - Define final event selection - study optimal object selection and cuts
 - Identify relevant systematic uncertainties and improve wherever possible
 - Take into account existing knowledge from W/Z+jets SM analyses
 - etc...
- Aim to have good quality results to make public by Summer
- **Important:** work towards a boosted VH analysis needs to be integrated with the on-going work at some point – plans in the planning being carefully planned...

Other channels

- $t\bar{t}H$ - semileptonic:
 - Multivariate analysis under development in Glasgow
 - Expect results from release 15 next week
 - Analysis moving to release 16
 - Edinburgh joined and ramping up
- $t\bar{t}H$ hadronic:
 - Ramping up:
 - Need up-to-date MC sample at 7TeV
 - Studying triggering options
- VBF $H \rightarrow b\bar{b}$
 - Currently studying trigger options

Other ongoing issues

- Good Run List – definition and maintenance
- Common monitoring code – prompt analysis after event reconstruction
 - Being investigated... plans in the planning