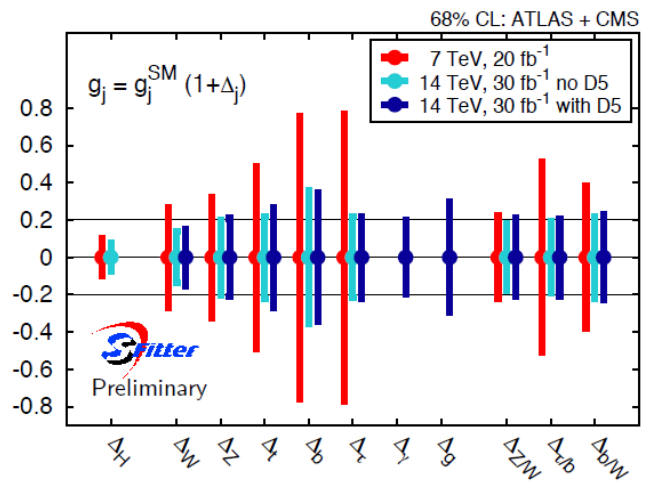
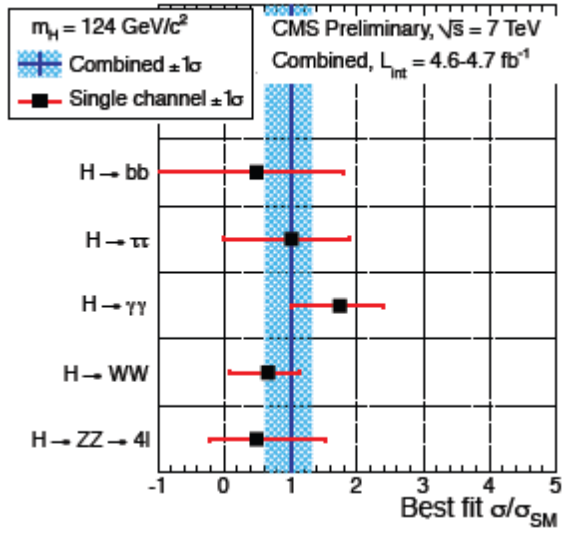
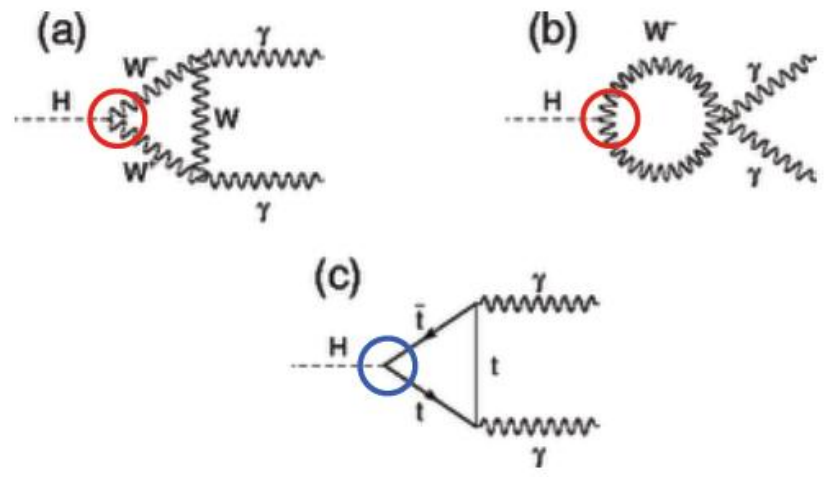
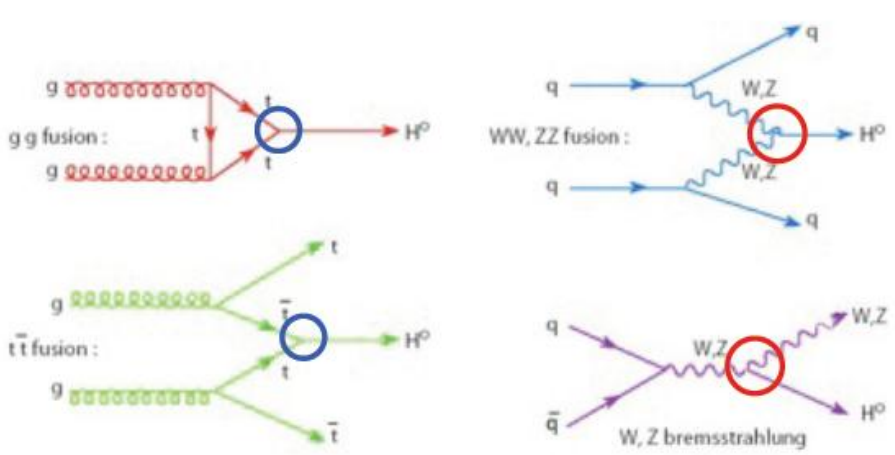


# European Strategy Group preparation: ATLAS plans

# New Higgs working group: Moving from combination of cross sections and branching ratios measurements to couplings determination



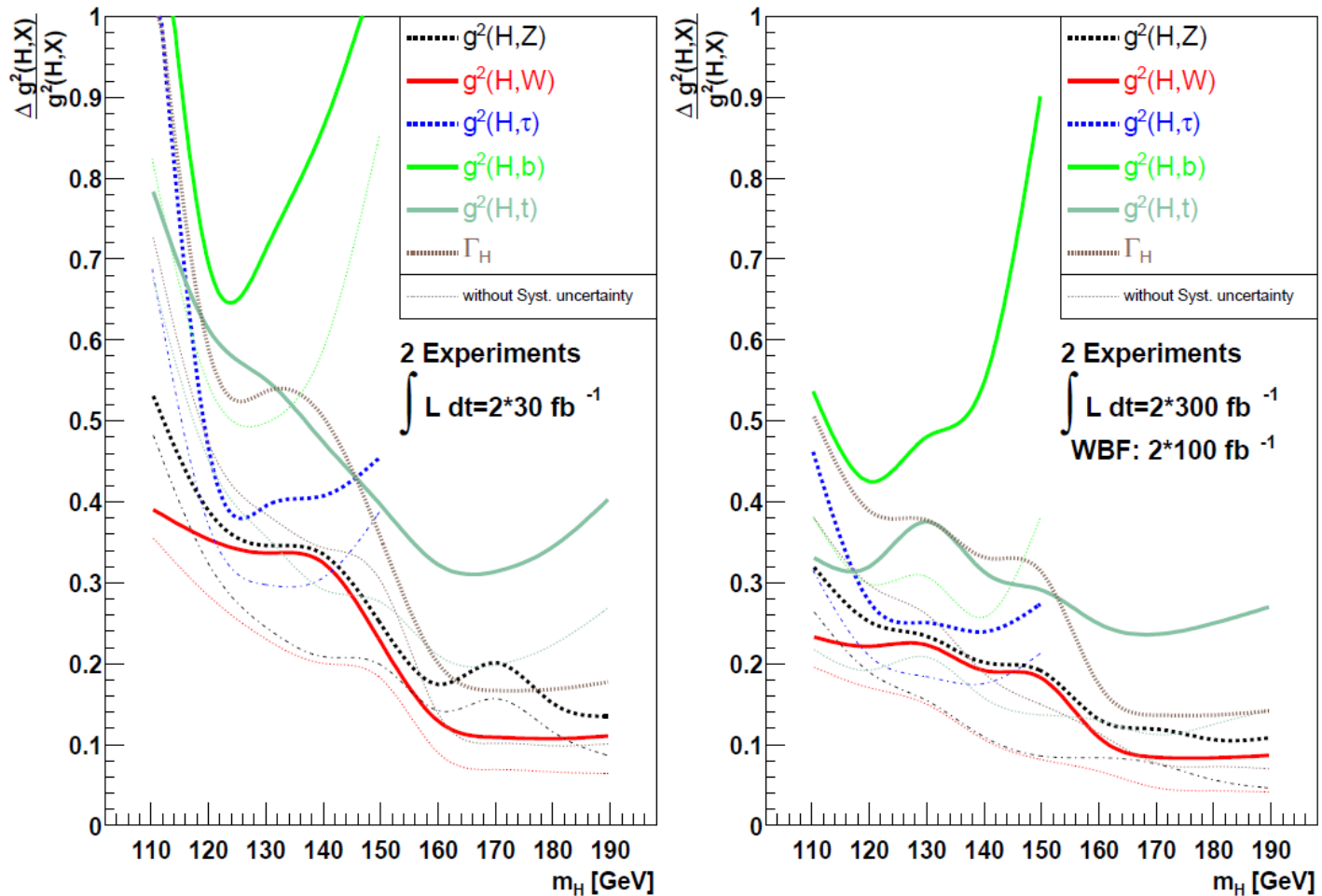


Figure 2: Relative precision of fitted Higgs couplings-squared as a function of the Higgs boson mass for the  $2 \times 30 \text{ fb}^{-1}$  (left) and the  $2 \times 300 + 2 \times 100 \text{ fb}^{-1}$  (right) luminosity scenarios for SM rates. Here we make the weak assumption that  $g^2(H, V) < 1.05 \cdot g^2(H, V, \text{SM})$  ( $V = W, Z$ ) but allow for new particles in the loops for  $H \rightarrow \gamma\gamma$  and  $gg \rightarrow H$  and for unobservable decay modes. See text for details.

# European Strategy Workshop

chaired by [Aleandro Nisati](#) (Universita e INFN, Roma I (IT))

Wednesday, 23 May 2012 from 09:00 to 17:00 (Europe/Zurich)  
at CERN ( 40-S2-D01 - Salle Dirac )


















## Description

### PRELIMINARY AGENDA

**Video Services** Video public room : [European\\_Strategy\\_Workshop](#) [Join Now!](#) | [More Info](#)

**Chat rooms** [European\\_Strategy\\_Workshop21\\_5\\_2012\\_](#) [More Info](#) | [Join now!](#)

Wednesday, 23 May 2012

- 09:00 - 09:10 Introduction 10'  
Speaker: [Aleandro Nisati](#) (Universita e INFN, Roma I (IT))  
Material: [Slides](#)  
- 09:15 - 09:40 ATLAS Upgrade: Overview 25'  
Speaker: [Giuseppe Iacobucci](#) (Universita de Geneve (CH))  
Material: [Slides](#) 
- 09:50 - 10:10 Strategy and tools for event simulation/reconstruction in high pile-up environment 20'  
Speaker: [Philip Clark](#) (University of Edinburgh (GB))  
Material: [Slides](#) 
- 10:20 - 10:40 Physics objects smearing, efficiency effects, etc, for ES studies 20'  
Speaker: [Aleandro Nisati](#) (Universita e INFN, Roma I (IT))  
Material: [Slides](#)  
- 10:40 - 11:10 Coffee Break
- 11:10 - 11:30 Higgs Couplings 20'  
Speaker: [Liron Barak](#) (Weizmann Institute of Science (IL))  
Material: [Slides](#) 
- 11:40 - 12:00 Higgs Self-Couplings 20'  
Speaker: [Cristina Oropeza Barrera](#) (University of Glasgow (GB))  
Material: [Slides](#) 
- 12:10 - 12:25 Higgs spin and CP 15'  
Speaker: [Justin Albert](#) (University of Victoria (CA))  
Material: [Slides](#)  
- 13:00 - 14:00 Lunch Break
- 14:00 - 14:20 W/Z - W/Z Scattering 20'  
Speaker: [Mario Campanelli](#) (University College London (UK))  
Material: [Slides](#) 
- 14:30 - 14:50 Exotics 20'  
Speaker: [Chris Pollard](#) (Duke University (US))  
Material: [Slides](#) 
- 15:00 - 15:20 Supersymmetry 20'  
Speaker: [Anadi Canepa](#) (TRIUMF (CA))  
Material: [Slides](#)  
- 15:30 - 15:45 European Strategy document(s) preparation 15'  
Speaker: [Klaus Monig](#) (Deutsches Elektronen-Synchrotron (DE))  
Material: [Slides](#) 
- 15:50 - 16:10 Discussion on strategy and plans towards the submission for Cracow 20'  
Speaker: [Aleandro Nisati](#) (Universita e INFN, Roma I (IT))  
Material: [Slides](#)  
- 16:10 - 16:30 Final discussion and Conclusion 20'  
Speaker: (ALL)

## Strategy to prepare input to the ES:

- Set priorities for the ATLAS input preparation
  - First, ensure studies for the HL-LHC, showing also what we can do by ~2022, i.e. at the end of Phase-1 ( $L \sim 300/\text{fb}$ )
  - Then, at a lower priority, produce results also for the LHC energy upgrade, HE-LHC

## For HL-LHC:

- What are the physics processes whose results still depend on data statistics, and that are marginally affected by HLLHC event pileup?  
Examples:
  - search for SUSY/BMS new physics signals
  - Higgs boson self-couplings
  - Rare Higgs boson decays
- What are the processes that are affected or that could be affected by large event pile-up?  
Examples:
  - Coupling studies using the final state VBF  $H \rightarrow \tau\tau$
- Given a physics channel, what is the optimal luminosity value that provides the best compromise between data statistics and pile-up degradation, and that therefore provides the best possible physics output?

## Notes to prepare:

The European Strategy group asks for input from the community.

ATLAS plans to contribute two documents:

- The case for a High Luminosity upgrade of the LHC (HL-LHC, phase 2 in our jargon)
- The case for a high energy pp collider in the LHC tunnel (HE-LHC)

Deadlines for submission:

- Input for Cracow meeting: 31 July
- Briefing book for strategy group: 15 October

The spirit of the note must be that there is a physics case and the ATLAS collaboration wants to work on that.

## Outline of the HL note:

- Introduction
  - Results up to now
  - The approved LHC program
  - The HL-LHC
- Higgs measurements (4 pages)
- Scenarios without a Higgs (3 pages)
- SUSY (2 pages)
- Exotics (2 pages)
- Top (1 page)
- Detector requirements for HL-LHC (0.5 pages)
- Conclusions (0.5 pages)

## Strategy for simulation studies

- No time for detailed simulation of physics processes, as well as full event reconstruction.
- The approach adopted is based on studies performed using MC truth, applying where simple smearing functions to physics objects, efficiency factors accounting for offline and trigger selection, etc.

## Plans for the coming weeks

- Complete the parameterization of physics objects performance
- Perform physics analyses assuming conservative/optimistic performance for a few crucial physics objects (Etmis, btagging, ...)
- Follow-up Workshop around the end of June