LHC Higgs Combination Group : Overview

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Introduction

- LHC-HCG initiated by ATLAS + CMS SP & PC
  - Met with ATLAS+CMS Higgs convenors on Nov 8th
- **Mandate**
  - Define the strategy for statistical combination of Higgs results from LHC experiments
    - **for EPS & Lepton-Photon conferences and beyond**
  - Prepare the inputs needed for the combination
  - Produce and help disseminate the combined results for SM Higgs
  - Consult with the Statistics committees of ATLAS and CMS regarding the statistical tools and procedures employed.
  - Consult with the Higgs cross section working group for input on various cross section and branching ratios.
- Several follow up meetings of ATLAS & CMS Higgs coordinators
  - Developed draft memo of understanding & timeline of work

Initial Composition

Role	ATLAS	CMS
Convenor	Bill Murray	Vivek Sharma
Overall Contact	Ketevi Assamagan	Andrey Korytov
Statistics Comm. rep	Eilam Gross	Gregory Schott
Higgs Cross Section rep	Reisaburo Tanaka	Chiara Mariotti

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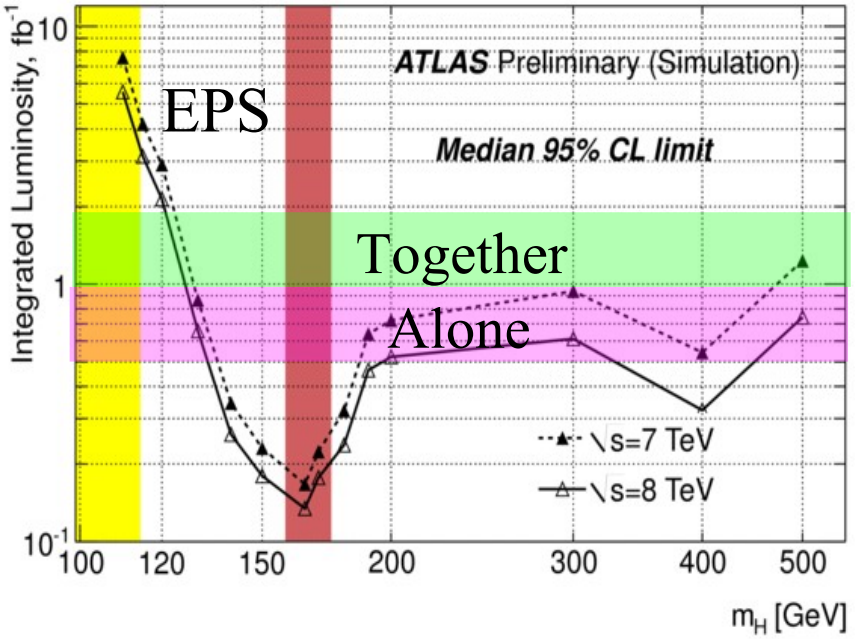
ATLAS & CMS Spokespeople + Physics Coordinators

With participation of experts as and when needed

Aims of LHC-HCG

- SM combination first (Later go to MSSM and beyond..)
  - Summer EPS meeting
  - 0.5 to 1 fb^{-1} data per experiment?
  - Many hurdles:
    - **Systematics handling**
    - **Big workspaces**
    - **Stat. Methods to fix**
    - **Discovery protocols**
    - **Working with ATLAS**
    - **Working with CMS**
    - ***Time***



Draft Timeline

Date	Goal / Achievement
Dec 6	Kick-off open meeting (OM) to discuss combination strategy
January	Compare Roostats & other commonly used tools
February	Stat methods, H→WW inputs
March	Precisions H→WW+0 jet comparisons, 1% agreement on limits reached
April 7	Discuss H→γγ, H→ZZ inputs. 1-2% agreement on H→WW+0/1/2 jets limits
April	Combine multiple channels, finalise stat. methods
May 12	OM to report on combination exercise on H→ WW, ZZ, γγ
May 19	WM to share summer analysis strategy, analysis definition. Prepare for combinations with data, start documentation on combined results
June30	WM to share prelim results with data, start combination process; exact process of sharing to be determined by SP & PC
July 14	WM on Combined results for EPS, review documentation
July 15	Start approval process within ATLAS & CMS; exact procedure to be determined by SP & PC
July 21	**EPS starts in Grenoble ; option to update for LP'11**

Sample Combination tests

- Toy combination exercise ongoing
  - Roostats based
  - WW plus 0/1/2 jets, $1 fb^{-1}$
  - More channels will get added soon

	ATLAS estimate	CMS estimate
σ/σ_{SM} using PL approximation	0.35568047	0.355681
LEP-like CLs	0.0032±0.0011	0.0014±0.0003

- Agreement within errors in ongoing test exercises
  - Learning Common systematics handling
  - Studying different stat. techniques

Systematics handling

- Systematics are very important at LHC
  - Need a well-understood frame to handle them
- Detector effects are assumed uncorrelated
  - Muon efficiency, jet energy scale, electron resolution
- Some things are not
  - Luminosity
  - Higgs cross-section
  - Influence of theoretical uncertainty on efficiency
- We are agreeing each, building framework to handle them

Conclusions

- Good working relationship established
- A long way to go to make real combination
  - But we are on the road
  - May 19th is critical date – need to go 'in camera'
- We intend to make the best possible use of the LHC