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Light Mass Higgs subgroup

Goal of the group

Quoting from the "letter of intent":

1. issues concerning $XS * BR$, in particular issues connected to the decays $H \rightarrow \gamma + \gamma$, $\tau + \tau$, bb , WW and ZZ
2. Higgs property measurements: Higgs mass, (width), $\sigma * BR$, J^{PC} , couplings (HVV, Yukawa, trilinear, quartic).

Discuss main theoretical issues (concerning $XS * BR$) and create tools to be used by ATLAS and CMS (+CDF+D0) to analyze Higgs boson data available in 2012 and beyond, including branching fractions, couplings to SM particles, anomalies in the present data ($\gamma + \gamma$ and WW signals), evidence of spin zero and how this possibility could be confirmed in the near future, separation of signal and backgrounds and strategy for measuring the mass and other characteristics of a putative signal.

Group Contacts

ATLAS		CMS		Theory		
Michael Dührssen (CERN)	Kirill Prokofiev (NYU)	André David (LIP)	Marco Zanetti (MT)	Ansgar Denner (Würzburg)	Massimiliano Grazzini (Zurich)	Georg Weiglein (DESY)

Action items

1. Explore the coupling structure within the LO framework
 1. Calculate theory uncertainties for whatever coupling parameters are used or give at least some limit estimate on the uncertainty. For now the SM cross section and BR uncertainties are used
 2. Check with jet group if additional uncertainties appear for a coupling fit due to analysis in exclusive jet bins
 1. Especially the ggH contamination to VBF categories is a problem
2. Develop a NLO coupling fit framework
 1. **Prepare a recommendation framework addressing effective BSM Lagrangian approaches and anomalous couplings**
3. Explore the Higgs coupling tensor structure
 1. **Prepare a recommendation framework for Spin/CP**
 2. Derive recipe how to simulate resonances with different SPIN and CP quantum numbers
 3. Check possibility of reweighting fully simulated SMMC events by ratio of matrix elements
 1. Possible with VBFNLO
 2. So far not possible with JHU
 4. Compare different parametrization for anomalous couplings of an observed resonance.
 5. For VBF tag jet based CP determination, especially the ggH contamination to VBF categories is a problem

Meetings

- CERN InDico Agenda [↗](#)
- LMH1: Kickoff [↗](#)
- LMH2: Couplings and tensor structure [↗](#)
- LMH3: Couplings and HXSWG workshop preparation [↗](#)
- Sixth LHC Higgs Cross Section Workshop [↗](#)
- LMH4: Couplings document [↗](#)
- LMH5: JCP discussion [↗](#)
- LMH6: BSM round-table [↗](#)
- LMH7: YR3 and BSM EFT follow-up [↗](#)
- LMH8: JCP: toward a recommendation. [↗](#)
- LMH9: Effective Field Theory. [↗](#)
- LMH10: Couplings' parametrisations. [↗](#)
- LMH11: JCP. [↗](#)

References and Links

- XSEC@TeV
- XSEC@TeV
- BR
- HDECAY [↗](#)
- VBFNLO [↗](#)
- JHU [↗](#)

Results

LHC HXSWG interim recommendations to explore the coupling structure of a Higgs-like particle

- The interim recommendations can be found here: [arXiv:1209.0040](#)
- A sample implementation of the coupling scale factor framework can be found on [SVN](#). For the implementation the following tables and numbers are used:
 - ◆ Calculated with HDECAY and copied from here:
 - ◇ partial decay width components for $H \rightarrow \gamma\gamma$
 - ◇ partial decay width components for $H \rightarrow Z\gamma$
 - ◇ partial decay width components for $H \rightarrow \text{gluon}$
 - ◇ running constants as function of m_H and fixed constants
 - ◇ The consistency was so far tested for the SM and the Fermiophobic model
 - ◆ Calculated within the MSSM group:
 - ◇ $gg \rightarrow H$ at 7TeV cross section splitting into top, bottom and interference component
 - ◇ $gg \rightarrow H$ at 8TeV cross section splitting into top, bottom and interference component
 - ◆ Calculated with VBFNLO:
 - ◇ VBF at 7TeV cross section splitting into W and Z component
 - ◇ VBF at 8TeV cross section splitting into W and Z component
 - ◆ Tables of SM BR:
 - ◇ WARNING: THESE FILE ARE NOT THE OFFICIAL INPUT FILES. PLEASE USE THE OFFICIAL Higgs_BR_2012_002.xlsx INPUT FILES ON THE MAIN CERN Yellow Report Page BR2012 PAGE
 - ◇ Vector Boson BRs
 - ◇ Fermion BRs
 - ◆ Example root script

Old Stuff

- moved to LHCHXS WLight Mass Old

-- Rei Tanaka - 23-Apr-2012

This topic: LHCPhysics > LHCHXS WLight Mass
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