

Table of Contents

LHC HXSWG for BSM Higgs (WG3)	1
Group organization	2
Extended Higgs Sector (neutral + charged Higgs bosons):.....	2
MSSM Higgs.....	3
NMSSM Higgs.....	3
Exotic Higgs Decays.....	4
Other groups.....	4
SVN repository and tools	5
Meetings	6
Mailing lists	7
WG3 related documentation	8
General documentation	9

LHC HXSWG for BSM Higgs (WG3)

LHCHXSWG3 is responsible to provide support and recommendations for BSM Higgs related issues.

Group organization

Group conveners:

ATLAS	CMS	THEORY
Anna Goussiou (Seattle) (2018)	David Sperka (Boston University) (2018)	Zhen Liu (U of Maryland) (2019) Pietro Slavich (LPTHE) (2017)

The conveners can be globally reached at the address lhc-higgs-bsm-convener@cern.ch (only if you already subscribed to the WG3 mailing list or the general HXSWG mailing list, see here).

The WG has appointed contacts for several topics which are of interest to the group:

Extended Higgs Sector (neutral + charged Higgs bosons):

- ATLAS: Lidija Zivkovic (2019), Jana Schaarschmidt (2016).
- CMS: Raffaele Gerosa (2015), Jan Steggemann (2019).
- Theory: Heather Logan, Rui Santos, Shufang Su.
- Twiki containing BRs numbers for $H^{+-} \rightarrow cb$ in the 3HDM: Hplus3HDM.
- Twiki containing cross section and BRs numbers for 2HDM: LHCHXSWG2HDM.
- Twiki containing cross section and BRs numbers for flavorful 2HDM: LHCHXSWG3Flavorful2HDM.
- Twiki for LFV Higgs decay in BGL.
- Twiki for 2HDM benchmarks.
- Twiki for the Georgi-Machacek model.
- Twiki for benchmarks other than 2HDM
- Twiki for the width and interference treatment recommended for a common treatment for ATLAS and CMS analyses.
- Twiki for charged Higgs.
- Email all the contacts here.
- Tasks discussed in the group and time lines:

Task	Involved persons	Status	Timescale
Check physics case for 3HDM, LRS, CPV, SM+Triplet models, in case provide cross sections and BRs		Planned	
Provide benchmark scenarios for searches for H_5 states in GM for masses below 200GeV	Heather Logan	In progress	Oct 24, 2018
Provide simulation tool for loop-induced $H^{+-} \rightarrow W^+ \gamma$ with fermiophobic H^+ in GM	Heather Logan	Done (need to document)	Mid 2018
Interface theory constraints for an additional singlet into ScannerS	Rui Santos	Done	End 2017
Provide cross sections and BRs for 2HDM+singlet models (real & complex)	Nikos Rompotis	Ready (produce on request)	End 2017
Prioritize channels according to importance for end of LHC run2/3 or HL-LHC	Shufang Su	In progress	End 2018
Keep an eye on potentially missing signatures		In progress	Continuous
Provide cross sections for charged Higgs pair production (Drell-Yan)	Heather Logan	Planned	End 2018?
Inclusion of 2HDM electroweak baryogenesis information in electroweak phase transition properties by using the BSMPT code by Maggie.	Nikos Rompotis	Planned	Oct 2018

Provide a model to interpret s-channel and charged Higgs pair production		In progress	
Provide theoretical predictions for interference effects for large width charged Higgs decays	Rui Santos	In progress	End 2018

MSSM Higgs

- ATLAS: Tim Barklow (2019)
- CMS: Andrew Gilbert (2017)
- Theory: Michael Spira, Pietro Slavich, Stefan Liebler
- contact all the conveners here
- Dedicated twiki with all the latest information is here.
- Tasks discussed in the group and time lines:

Task	Involved persons	Status	Timescale
Update SM parameters for MSSM calculations to be consistent with YR recommendations for SM calculations		Complete	Sept 2018
Provide new MSSM benchmark scenarios		Complete	Sept 2018
Provide updated ROOT files for end RunII analyses		In progress	End 2018
Provide description and common tool for BSM Higgs pT calculation @ NLO+PS precision for gluon fusion		In progress (link)	Sept/Oct 2018
Provide benchmark scenario for low tan β using EFT approach		Planned	End 2018
Prioritize channels according to importance for end of LHC run2/3 or HL-LHC		Planned	End 2018
Keep an eye on potentially missing signatures		In progress	Continuous

NMSSM Higgs

- ATLAS: Nikos Rompotis (2018)
- CMS: Abideh (Nadjieh) Jafari (2017)
- Theory: Ulrich Ellwanger, Margarete Mühlleitner, Nausheen Shah
- Email all the conveners: here
- Twiki with all group information: LHCHXSWG NMSSM
- Tasks and timelines:

Task	Involved persons	Status	Timescale
Re-interpretation of public experimental results	Theorists	In progress	Continuous
Identification of NMSSM specific signatures not searched for by ATLAS/CMS	All	In progress	Milestone: Dec 2018 summary
Benchmark lines/plans/bands for ATLAS/CMS	All	In progress	Milestone: Dec 2018 summary
LHCHXSWG internal note to document benchmarks	All	In progress	to start if benchmarks are used

Exotic Higgs Decays

- ATLAS: Lily Morvaj (2018)
- CMS: Cecile Caillol (2017)
- LHCb: Lorenzo Sestini
- Theory: Brian Shuve, Matthias Konig
- Dedicated twiki with all the latest information is here
- email all the conveners here
- Tasks discussed in the group and time lines:

Task	Involved persons	Status	Timescale
Provide a benchmark for interpretations of $h \rightarrow aa \rightarrow 4\gamma/2g2\gamma$ searches	need volunteers	Proposed	
Study feasibility for searches for Higgs decays involving one or more displaced vertices.	All	Planned	June 2019
Add feasibility studies for Higgs rare decays beyond $\gamma\gamma+J/\Psi$, $\gamma\gamma+\phi$, $\gamma\gamma+\text{Upsilon}$	Experimentalists	In progress within collaborations	Full Run 2 papers
Add feasibility studies for $h \rightarrow 2f+\text{MET}$ and develop benchmark scenarios predicting this type of signatures	All	In progress	Spring 2019
Reinterpret prompt decays results for LLP signatures	Experimentalists	In progress within collaborations	Full Run 2 papers
What is the best way to present Higgs searches with displaced vertices to allow a simple recast by theorists?	Jessie Shelton, Zhen Liu, Cecile Caillol	In progress	End of 2019
Provide final recommendations for $h \rightarrow W/Z+\text{meson}$: link	Zhen Liu, Stefan Alte	under review	
Providing the tool for the experimentalists to calculate $\text{Br}(H \rightarrow aa \rightarrow xx\gamma\gamma)$ for different 2HDM+S scenarios (from arXiv:1802.02156 authors) Note: Instead of a tool, ready to use txt files provided for multiple $\tan(\beta)$ values.	Ljiljana Morvaj	DONE	End of summer 2018

Other groups

Other useful information for LHC HXSG task forces/sub-groups that are relevant to WG3 activities:

- Branching ratio sub-group: twiki is here, contact them by clicking here
- Di-Higgs sub-group: twiki is here, contact them by clicking here.

SVN repository and tools

There is an SVN repository in which various WG3 items are stored. For the time being the following folders are

- [2HDM](#)
- [MSSM](#) for neutral and charged Higgs

If you need to put something on SVN or you have some question please contact the WG3 conveners.

The list of the notes (public, interim recommendations and internal) is [here](#).

Meetings

Indico page of the WG3 [↗](#)

Mailing lists

How to subscribe to mailing lists

The mail address for the WG3 is lhc-higgs-bsm@cernNOSPAMPLEASE.ch. All messages are archived [here](#).

We highly recommend to also be subscribed to the general HXSWG mailing list:
lhc-higgs@cernNOSPAMPLEASE.ch.

The conveners can be reached at lhc-higgs-bsm-convener@cernNOSPAMPLEASE.ch, but only if you already subscribed to either the WG3 mailing list or the generic lhc-higgs HXSWG mailing list.

WG3 related documentation

All the documents, public and internal can be found in the LHC HXSG Library.

- [arXiv:1607.05291](#): Intermediate mass region for charged Higgs production, Celine Degrande, Rikkert Frederix, Valentin Hirschi, Maria Ubiali, Marius Wiesemann, Marco Zaro.
- [LHCHXSWG-2015-002](#): public note on low tanbeta MSSM scenarios.
- The 10th workshop of the LHC HXSG has a good overview of the topics studied in WG3 up to July 2015.
- Low tanbeta scenarios note [LHCHXSWG-INT-2015-004](#), to become public soon.
- Georgi-Machacek VBF $H^+ \rightarrow WZ$ Public LHC HXSG note [LHCHXSWG-2015-001](#).
- Heavy charged Higgs cross sections update: Martin Flechl, Richard Klees, Michael Krüamer, Michael Spira, Maria Ubiali, Improved cross-section predictions for heavy charged Higgs boson production at the LHC. [arXiv:1409.5615](#), Phys.Rev. D91 (2015) 7, 075015.
- Interim recommendations for the evaluation of Higgs production cross sections and branching ratios at the LHC in the Two-Higgs-Doublet Model, [LHCHXSWG-2013-001](#).

General documentation

A great deal of information can be found in the three CERN Reports: Handbook of LHC Higgs Cross Sections:

1. Inclusive Observables ([CERN-2011-002](#), [arXiv:1101.0593](#)).
2. Differential Distributions ([CERN-2012-002](#), [arXiv:1201.3084](#)).
3. Higgs Properties ([CERN-2013-004](#), [arXiv:1307.1347](#)).
 - ◆ BibTeX and LaTeX citation format for CERN-2011-002 ([arXiv:1101.0593](#)), CERN-2012-002 ([arXiv:1201.3084](#)) and CERN-2013-004 ([arXiv:1307.1347](#)).

-- MarioPelliccioni - 16 Jul 2014

This topic: LHCPhysics > LHCHXSWG3

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