

Introduction

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on behalf of WG3 Extended Higgs Sector conveners:

M. d'Alfonso, S. Laurila, TR, N. Rompotis, R. Santos, L. Zivkovic

LHC Higgs Working Group WG3 (BSM)
Extended Higgs Sector subgroup meeting
16. November '22

Facts

- **conveners:** L. Zivkovic (Belgrade), N. Rompotis (Liverpool), ATLAS; M. d'Alfonso (MIT), S. Laurila (CERN), CMS; T. Robens (Zagreb), R. Santos (Lisbon), Theory
- **Twiki:**
<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/LHCHWG3EX>
- **Email (conveners/ all):**
[lhc-higgs-neutral-extended-scalars-convener_at_cern.ch/](mailto:lhc-higgs-neutral-extended-scalars-convener_at_cern.ch)
lhc-higgs-neutral-extended-scalars_at_cern.ch
- **egroup:** [lhc-higgs-neutral-extended-scalars](#)

Recent activities

- reinstated regular meetings, focus on

- A) Overlooked signatures**
- B) Width and interference effects in BSM searches**
- C) Recasts**
- D) ...**

- **6./7.7.21: <https://indico.cern.ch/event/1050919/>**
- **5.11.21: <https://indico.cern.ch/event/1091117/>**
- around ~ 30 talks over the 3 days

Joint activities with WG2: CP violation and Higgs Sector

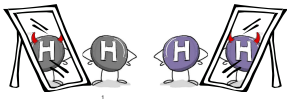
one meeting in July this year

CPV in Higgs interactions: WG2/WG3 (extended Higgs) joint meeting

WG3: Mariarosaria d'Alfonso, Santeri Laurila, Tania Robens, Nikos Rompotis, Rui Santos, Shufang Su & Lidija Zivkovic

WG2: Nicolas Berger, Mauro Donega, Ken Mimasu & Daniele Barducci

23rd June 2022



Joint WG2/WG3 activity

Today's meeting!

- Received several kick-off meeting contributions that overlapped with WG3 (extended Higgs sector) interests
- Many interesting signatures of spontaneous/explicit CPV in extended Higgs sectors
- From mixing of would-be CP-even/odd eigenstates

Discovery of BSM Higgs
in multiple decay channels
⇒ CPV

Classes	C_1	C_2	C_3	C_4	C_5
Decays	$h_0 \rightarrow h_2 Z$	$h_2 \rightarrow h_1 Z$	$h_3 \rightarrow h_1 Z$	$h_3 \rightarrow h_2 Z$	$h_3 \rightarrow Z Z$
	$h_2 \rightarrow h_1 Z$	$h_1 \rightarrow Z Z$	$h_1 \rightarrow Z Z$	$h_2 \rightarrow Z Z$	$h_2 \rightarrow Z Z$
	$h_3 \rightarrow h_1 Z$	$h_2 \rightarrow Z Z$	$h_3 \rightarrow Z Z$	$h_3 \rightarrow Z Z$	$h_1 \rightarrow Z Z$

WG3 Proposal for CP violating benchmarks in the C2HDM ~ 2015
[Fontes et al.; PRD 92 (2015) 055014]

$\hat{h}_{1,2,3}$ -style CP properties
study for BSM scalars
⇒ CPV

Decay angular distributions etc.

6

[Slides from K. Mimasu, <https://indico.cern.ch/event/1173518/>]

goal:
study CPV in models with extended Higgs sectors
will result in whitepaper/ report/ ...

next meeting with WG2: 11.1.2023
topic: CPV in couplings to gauge bosons

next general meeting: 28.-30.11.22
in person (hybrid), CERN,
[<https://indico.cern.ch/event/1169286/>]

Topic today: any work that could be relevant for the next run in the framework of extended scalar models

subscribe to our e-group !!
lhc-higgs-neutral-extended-scalars