

Summary of the WG3 session

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Introduction

- This is a short (and maybe incomplete) summary of the discussions today
- The focus on the discussion was future plans
- This discussion will serve as input to understand what the needs are in terms of manpower, whether a change in structure is needed and how to proceed in the future

For reference: the YR4 WG3 chapter link on CDS

<https://cds.cern.ch/record/2150772/>

Summary of sub-groups

- Neutral MSSM
 - From the oldest and most effective sub-groups
 - Main object: cross sections and BRs for MSSM scenarios (mh-max, mh-mod etc)
 - In YR4: expanded the mass range; include some H⁺ decays
 - Recent/future progress
 - low $\tan\beta$ scenarios; EFT with heavy susy (on-going)
 - signal simulation: Higgs pT spectrum in gluon fusion
 - Addition of charged MSSM Higgs cross sections in the tools
 - More models: CP and flavour violation; effects in h125 couplings

Summary of sub-groups

- Charged MSSM
 - From the oldest and most effective sub-groups
 - Main object: cross sections and BRs in various MSSM scenarios
 - Recently expanded to
 - Intermediate mass region (inclusive cross section numbers maybe available as soon as next week)
 - MC recommendations
 - Intermediate mass region results need to be discussed in the group in more detail

Summary of sub-groups

- Extended scalars
 - 2HDM, singlet, GM triplet: concrete recommendations, numbers and benchmarks for all these
 - In 2HDM/singlet a large number of benchmarks
 - Remains to be seen whether they will be used or not (and how will be used); will need to be more active here interacting with experimenters in the future
 - Recent/future studies include:
 - X750 in the GM model
 - Particular signatures $H_i \rightarrow H_j H_k$
 - Other more exotic models

Summary of sub-groups

- Exotic Higgs decays
 - The group has succeeded in establishing a very vivid theory-experiment interaction; active in organizing meetings/workshops
 - Have also provided BRs for rare Higgs decays (interaction with BR sub-group – see also Daniela's slides)
 - Interactions with experimenters about triggers
 - Need to be extended
 - Provided some benchmarks e.g. for displaced vertices; (have already started being used!)
 - Potential for more connections
 - with other WG3 groups: extended scalars

Summary of sub-groups

- NMSSM
 - In YR4 there has been a systematic effort to collect available tools and discuss benchmarking
 - Suggestions for future work: distinguish NMSSM from other models; NMSSM–specific properties
 - We need to make an effort here to bring these results to the experimental NMSSM community

Summary of sub-groups

- “bbH”
 - This is a cross group, not directly under WG3 umbrella
 - Lots of connections with WG1, since it does not work as traditional WG3 sub-groups work
 - Topics discussed:
 - New recommendations: inclusive and differential
 - Study of matching schemes
 - These topics have still work to be done in the future

Final remarks

- The sub-groups in WG3 are well defined and their responsibilities have only small overlap
- There are several important tasks that need to be completed (e.g. intermediate mass region in charged Higgs)
 - Some of them may need to change depending on the outcome of X750 search
- They have succeeded in organizing a theory-experiment cooperation
 - Though there is need to push a bit more in some cases
 - There has been a lot of benchmarks in the YR4; question: will be useful to the experiment?