8th March 2021

ECFA Physics, Experiments & Detectors at Higgs and top/EW Factories Study
Mandate for Physics Potential working group

The Working Group is expected to

- Set up a forum on physics potential of future Higgs and top/EW factories to collect, compare and harmonise the work of the different project-specific coordinated efforts, as well as independent theoretical and experimental research on the subject. The perspectives of the (HL-)LHC on physics targets, that are in common or in synergy with those of the future Higgs and top/EW factory, are part of the mandate.
- Identify thematic areas or specific topics where concrete work should be organised in the context of the ECFA Working Group, in coordination with the existing project-specific Working Groups. The main focus should be on problems that are common to several Higgs and top/EW factories, and/or relevant to identify synergies. Small thematic groups/task forces could be appointed to carry out concrete work and deliver notes and/or original publications.
- Propose ideas for new observables, new experimental tests, new ancillary measurements

A tentative list of focus areas include, but is not limited to:

- EFT (global) interpretation of Higgs factory measurements, including EW, Z pole and top physics, and its impact on concrete new physics scenarios and models.
- Extend the study of the impact also on specific models that cannot be matched onto EFT.
- Exploration of different flavour scenarios and interplay with flavour data.
- Identification of measurements that HL-LHC can do in order to increase the physics potential of the future Higgs and top/EW Factory.
- HL-LHC precision physics interplay with the Higgs and top/EW factory potential, including the not-yet-complete assessment of the high-p_T probes potential at the HL-LHC. Comparative attention should also be paid to the potential of other future colliders.
- Requirements for accuracy in theoretical calculations and parametric uncertainties, and perspectives to achieve it.
- Perspectives for experimental uncertainties.
- Broad exploration of the new physics discovery potential of the future Higgs and top/EW factory, including the search for Feebly Interacting Particles also in connection with "Physics Beyond Colliders" activities.
- Availability and development of Monte Carlo generators required to achieve the physics goals.

Studies relating to a common approach to systematic uncertainties and the ultimate achievable precision are likely to be undertaken jointly between this group and the Physics Analysis Methods working group.

In consultation with the IAC, the group conveners will define a work programme, and identify (if/when needed) lead people to take forward each activity. The conveners will facilitate regular working group meetings towards the preparation of general ECFA workshops.

Work on some of the items above has been initiated in the "Higgs@FutureColliders" ECFA Working Group (https://arxiv.org/abs/1905.03764).