**Minutes for Snowmass Progress Meeting**

Time: 2022/01/25 10:00—12:00

Partipants: 31

A reminder for Snowmass participants:

Please contact the conveners after submitting the papers, you can put Liantao and Manqi in cc, in case there is no response from the convener. The deadline is 15 March.

**Talk 1: Electroweak Phase Transition in Exotic Higgs Decays with CEPC, by Xuliang Zhu**

The strong first-order electroweak phase transition are analyzed using ZH to llbbbb samples. Various parameters are used in the cut flow, and then applied in the BDT training. The fitted result shows consistence with the theoretical prediction.

Comments:

 1. The BDT result is worse than cut base result, this is not yet understood and need further investigation.

 2. The CEPC prediction is worse than FCCee, this need to be checked if the setups are the same

 3. Besides Z to ll channels, the Z to neutrinos channel is also promising and worth a similar analysis

**Talk 2: SUSY Global fits with future colliders using GAMBIT, by Yang Zhang**

The paper is already finalized and it is supposed be submitted mid February. Global fit with different SUSY models (CMSSM, NHUM1, NNHUM2, MSSM7) are studied using available data, and assumptions for each model are presented. The phase space for DM mass and sparticle mass are shown, theoretical uncertainties of SM Higgs are taken into account. Different Higgs factories are compared, it shows the ILC has better precision than FCCee and CEPC, mainly because the better performance in Hbb and HWW channels.

Comments:

 1. The better precision of ILC might because the comparison is using 500GeV run with 4ab-1

 2. EW precision limit is included, but not studied in Gambit due to technical reason

**Talk 3: Long-lived ALP Searches with Far Detectors at the Electron Positron Collider, by Kechen Wang**

The design of FAR detector is presented, different location is under consideration: on the ground, inside the experimental hall, or in the cavern. The far detector is proposed to search the long lived particle with very long decay length. In this talk, the process used is ee to γa with a to γγ at Z pole. The kinematic distribution shows that the FAR detector should be placed at the centre region, perpendicular to the beam line. The average decay probability shows that the smaller distance between the IP and the far detector is better for the discovery. The bigger volume is also favored in the discovery limits.

Comments:

 1. The accuracy of Higgs decaying to LLP is better than LHC, even though there is less Higgs, but the backgrounds are efficiently reduced

 2. Can the photons be the ALP trigger? For photons, the direction can not be reconstructed with enough accuracy, which will introduce large amount of backgrounds.

**Talk 4: Probing relatively heavier selectron in the CEPC, FCCee, and ILC in the GmSUGRA, by Shabbar Raza**

The General minimal Supergravity (GmSUGRA) model is presented, and the light neutralino from GmSUGRA search results are shown, via the process with bino decaying to axion and gamma. The analysis is supposed to be finalized in a few weeks, and the draft will be ready by the end of February.

Comments:

 1. The InvM in the plot is actually the recoil mass.

**Talk 5: Hunting for light heavy neutrinos at future Z-factories, by Yinfa Shen**

The right-hand heavy neutrino searching is presented in this talk. The signal process is the Z to a left-hand neutrino and a right-hand heavy neutrino, decaying to a lepton and two jets. Since the heavy neutrino has a large mass, the monojet method is applied in this analysis. Other parameters from the missing energy, jets, and substructures are used in the cut chain. Result shows that the constrain |Vlj|2 for 5-10GeV heavy neutrino mass range can be improved to more than existing results.

Comments:

 1. Besides the current cut chain, the tau bkg should be reduced using the multiplicity.

 2. The plots shown here are the results considering the displacement of heavy neutrino, for these without the displacement the distribution will be flat.