

Title: Measurements of $H \rightarrow \tau\tau$ properties at FCC-ee

Authors: Sofia Giappichini, Jan Kieseler, Markus Klute, Matteo Presilla, Aaron Wiedl, Xunwu Zuo

Abstract: The Future Circular Collider (FCC) stands at the forefront of the European Strategy for Particle Physics as the future Higgs factory. The $H \rightarrow \tau\tau$ decay, featuring a large branching ratio, clean identification at FCC-ee environment, and the possibility to reconstruct polarization information, is an excellent channel to measure Higgs properties. The CP nature of the $H\tau\tau$ coupling is of particular interest because the CP-odd component only appears in Higgs gauge couplings through loop effects, while it is allowed to be sizable in the Higgs couplings to fermions. This contribution shows recent progress in the experimental setup for the $H \rightarrow \tau\tau$ analysis and reports prospective results in both the ZH , $H \rightarrow \tau\tau$ cross section measurement and CP measurement, as well as the interpretation framework based on SM effective field theory.

Title: Measurement of top quark CKM elements at FCC-ee

Authors: Sarah Alshamaly, Sofia Giappichini, Simon Keilbach, Jan Kieseler, Markus Klute, Matteo Presilla, Xunwu Zuo

Abstract: The CKM matrix is a central piece for the understanding of electroweak physics. Particularly, the CKM element $|V_{ts}|$ is not directly measurable at tree level in current experiments in a precise manner. The current most precise value, indirectly determined via B_s meson mixing, is highly model-dependent and dominated by theory uncertainties. The FCC-ee experiment expects to produce $2M \sqrt{s}$ events with a very clean environment, providing an excellent opportunity to probe the $|V_{ts}|$ through $t \rightarrow W^+ b$ decay directly and in a model-independent way. This contribution summarizes the recent study on the $|V_{ts}|$ measurement at FCC-ee and discuss its theory impacts.

Title: Searching for type I seesaw mechanism in a two Heavy Neutral Leptons scenario at FCC-ee

Authors: Sehar Ajmal, Patrizia Azzi, Sofia Giappichini, Markus Klute, Orlando Panella, Matteo Presilla, Xunwu Zuo

Abstract: This contribution reports the search for heavy neutral leptons (HNL) in the type I seesaw mechanism at the Future Circular Collider in its e^+e^- stage (FCC-ee), considering an integrated luminosity of 204 ab^{-1} collected at the Z pole. The study examines two generations of heavy neutral leptons produced in association with Standard Model (SM)

neutrinos and decaying to a purely leptonic final state. This theoretical framework can explain neutrino oscillations and other open questions of the SM, providing a broader perspective on the relevance of this experimental search. The analysis is performed using a fast simulation of the IDEA detector concept to study potential HNL interactions at the FCC-ee. The sensitivity contours are obtained from a selection of kinematic variables aimed at improving the signal-to-background ratio for the prompt production case. In the case of long-lived HNLs, the background can be almost fully eliminated by exploiting their displaced decay vertices. The study shows that the FCC-ee has a significant sensitivity to observing these objects in a region of the phase space not accessible by other experiments.