Contribution ID: **4** Type: **not specified**

Connecting low- and high-energy observables at future colliders

Wednesday, 13 November 2024 14:45 (13 minutes)

Establishing the physics potential of future colliders is one of the main objectives of the HEP community in the coming years. The aim is on the one hand to consolidate the physics expectations from a circular collider working between the Z-pole and the ttbar threshold (FCC-ee at CERN) and exploring completely new avenues and technologies such as a multi-TeV e+e- or even mu+mu- collider. In light of that, this work aims at connecting the potentialities of low-energy experiments (e.g. the muon g-2 experiment at Fermilab, Belle II at KEK, MEG-II at PSI) with the possibilities that will open at precision e+e- colliders. The main point is to access information on the SM which is currently out of reach. In particular, an initial study is aimed at the phenomenology of Lepton Flavor Violation (LFV) where we have investigated the reaches of low-energy experiments as well as high-energy experiments (like the HL-LHC and future colliders). Assuming heavy New Physics (NP), the study of LFV effects is based on tools and techniques of effective field theories. In particular, we evaluated the decay rates for several LFV processes as well as the cross sections for the LFV high-energy scatterings in the SMEFT. In addition, we placed bounds on the fundamental parameters of the NP framework, showing that new infrastructure can better constrain the parameter space than low-energy experiments, specifically for observables related to tau production.

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Session Classification: Young Scientist Forum