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Particle Physics at LPTHE

Mardi 17 Janvier 2023, 14 :00
LPTHE, library
Domaines : hep-ph

Titre : *Quantum information and CP measurement in H to tau+ tau- at future lepton colliders*

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Résumé : *We introduce a methodology and investigate the feasibility of measuring quantum properties of tau lepton pairs in the H to tau+tau- decay at future lepton colliders. In particular, observation of entanglement, steerability and violation of Bell inequalities are examined for the ILC and FCC-ee. We find that detecting quantum correlation crucially relies on precise reconstruction of the tau leptons rest frame and a simple kinematics reconstruction does not suffice due to the finite energy resolution of the colliding beams and detectors. To correct for energy mismeasurements, a log-likelihood method is developed that incorporates the information of impact parameters of tau lepton decays. We demonstrate that an accurate measurement of quantum properties is possible with this method. As a by-product, we show that a novel model-independent test of CP violation can be performed and the CP-phase of Htautau interaction can be constrained with an accuracy comparable to dedicated analyses, i.e., up to 7.9 and 5.4 at ILC and FCC-ee, respectively*