Contribution ID: **32** Type: **not specified**

CP asymmetry in the angular distributions of $\tau \to K_S\pi\nu_\tau$ decays

Saturday, 13 November 2021 09:40 (20 minutes)

In this work, we proceed to study the CP asymmetry in the angular distributions of $\tau \to K_S\pi\nu_\tau$ decays within a general effective field theory framework including four-fermion operators up to dimension-six. It is found that, besides the commonly considered scalar-vector interference, the tensor-scalar interference can also produce a nonzero CP asymmetry in the angular distributions, in the presence of complex couplings. Using the dispersive representations of the $K\pi$ form factors as inputs, and taking into account the detector efficiencies of the Belle measurement, we firstly update our previous SM predictions for the CP asymmetries in the same four $K\pi$ invariant-mass bins as set by the Belle collaboration. Bounds on the effective couplings of the nonstandard scalar and tensor interactions are then obtained under the combined constraints from the CP asymmetries measured in the four bins and the branching ratio of $\tau^- \to K_S\pi^-\nu_\tau$ decay, with the numerical results given respectively by $\mathrm{Im}[\hat{\epsilon}_S] = -0.008 \pm 0.027$ and $\mathrm{Im}[\hat{\epsilon}_T] = 0.03 \pm 0.12$, at the renormalization scale $\mu = 2$ GeV in the $\overline{\mathrm{MS}}$ scheme. Using these best-fit values, we also find that the distributions of the CP asymmetries can deviate significantly from the SM prediction in almost the whole $K\pi$ invariant-mass regions. The current bounds are still plagued by large experimental uncertainties, but will be improved with more precise measurements from the Belle II experiment as well as the proposed Tera-Z and STCF facilities.

[arXiv:2107.12310]

Presentation type

Oral

Primary author: 陈丰之 (Sun Yat-Sen University)

Co-authors: Prof. ZHANG, Hong-Hao (School of Physics, Sun Yat-Sen University, Guangzhou 510275, China); Dr PENG, Shi-Can (Central China Normal University); Prof. LI, Xin-Qiang (Central China Normal University); Prof. YANG, Ya-Dong (Central China Normal University)

Presenter: 陈丰之 (Sun Yat-Sen University)